THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LIII. No. 1339.] LONDON, JANUARY 8, 1889. [41ST YEAR. Price 6d.

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Warranted Free from Adulteration. **TORBAY PAINTS.**
FOR GASHOLDERS, &c., &c.
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Ashmore, Benson, Pease, & Co., Ld.,
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Manufacturing Gas Engineers.
See Advertisement, p. 87.

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SUITABLE FOR ALL CHANGES.
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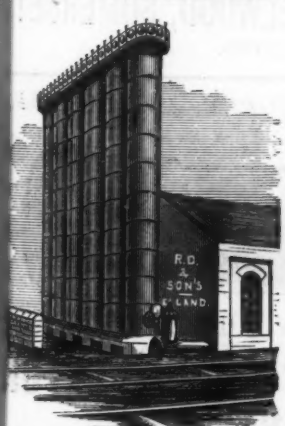

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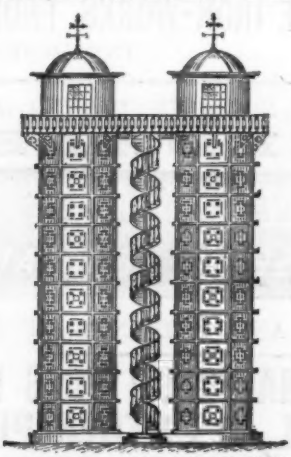
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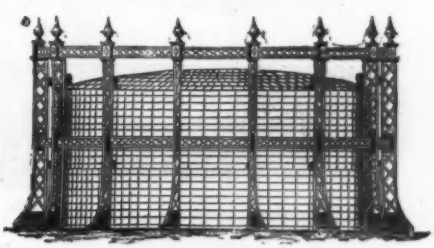
OURS continue to give the BEST RESULTS.

ESTIMATES SPECIFICATIONS, & ILLUSTRATIONS ON APPLICATION.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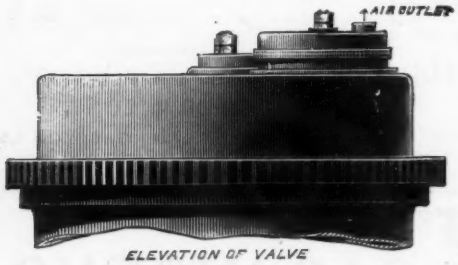
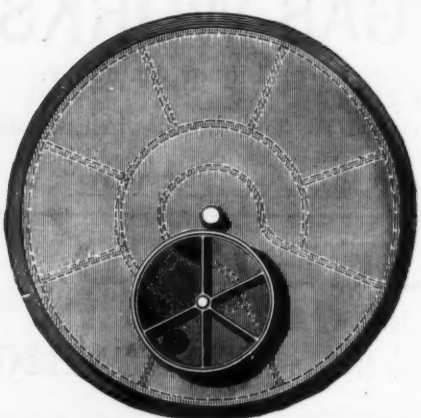


ELEVATION OF VALVE



PLAN OF TOP OF CENTRE VALVE FOR FOUR PURIFIERS

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Many of these Valves have been fixed, and are giving every satisfaction.

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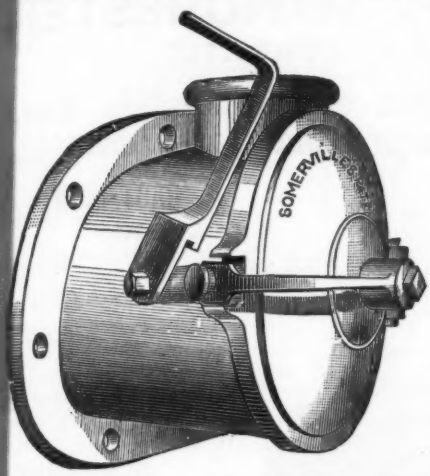

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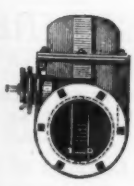

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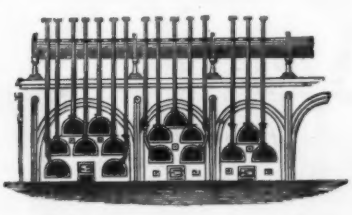

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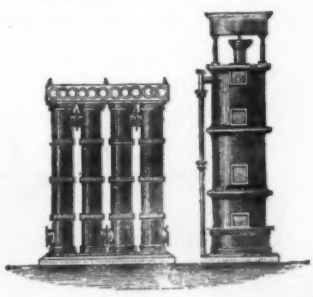

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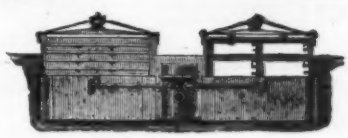

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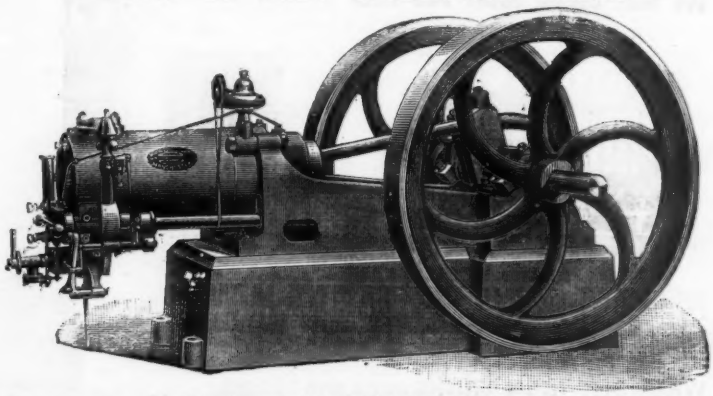

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FOR

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EXTRACTION OF AMMONIA FROM GASES

FROM COKE-OVENS AND BLAST-FURNACES.

AT THE PRESENT DATE

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EQUAL TO A

Daily Capacity of 306,600,000 Cubic Feet of Gas,

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ARE

GIVING UNIVERSAL SATISFACTION.

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SIDNEY HERSEY, Esq., Secretary. *Horseferry Road, Westminster, S.W.,*

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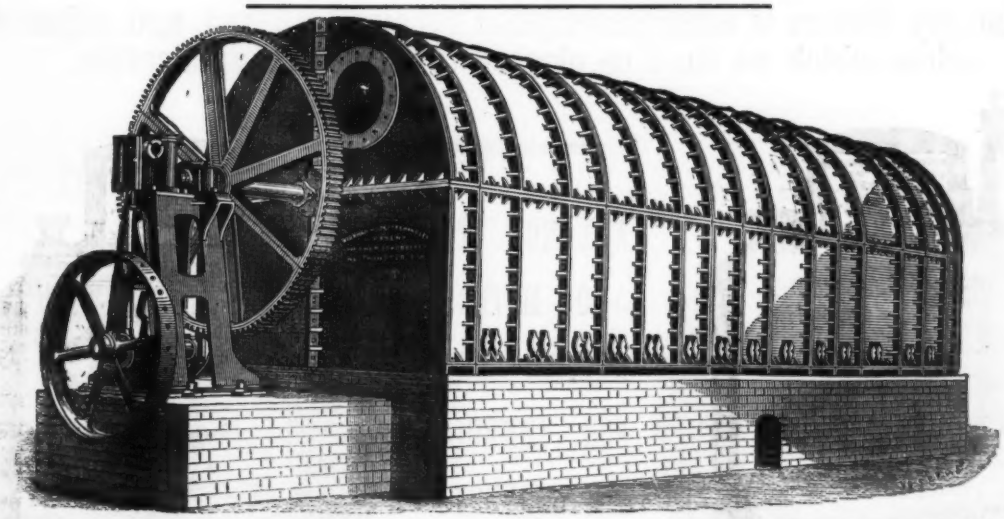
Dear Sir,—In reply to your letter of yesterday's date, I beg to say that the Washer-Scrubbers that you have supplied us with at our several Works continue to give every satisfaction.—I remain, yours truly,

(Signed) G. C. TREWBY.

Testimonials as to Efficiency are too numerous for publication, but can be had on application at the Company's Offices.



This engraving represents one of the four "Standards," for 5,000,000 feet each, erected for the Corporation of Leeds, and now in use at the New Wortley Station;

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AND

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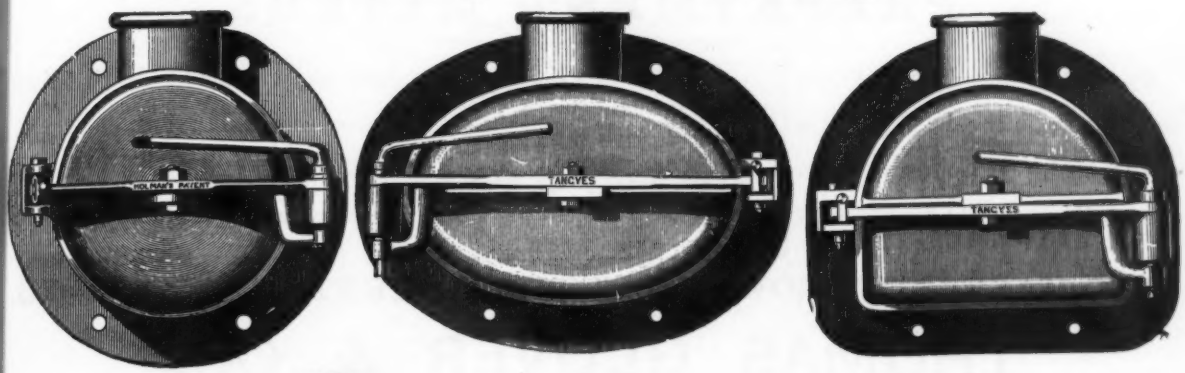

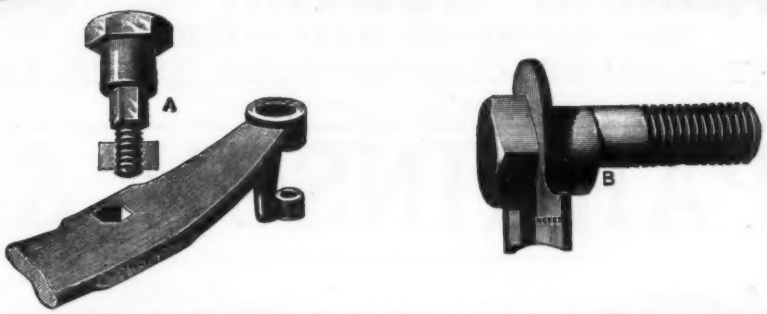

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"Yours faithfully, (Signed) "GEORGE LIVESEY."

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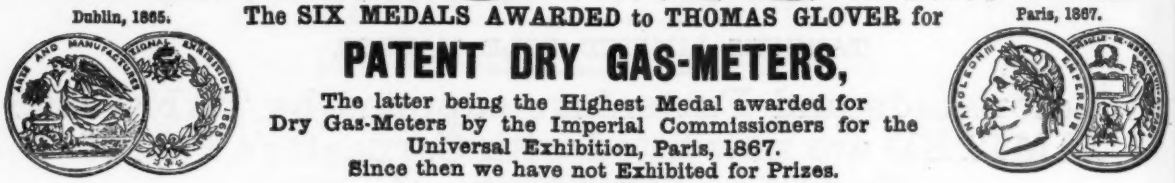

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PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.
Since then we have not Exhibited for Prizes.

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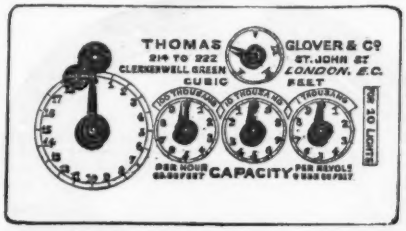
By setting the Hand of the large Circle on the left-hand side of the Dial, Gas Companies can allow a Consumer to receive only



the exact amount of Gas they have received prepayment for, and thus avoid the unpleasantness of asking users for a deposit.

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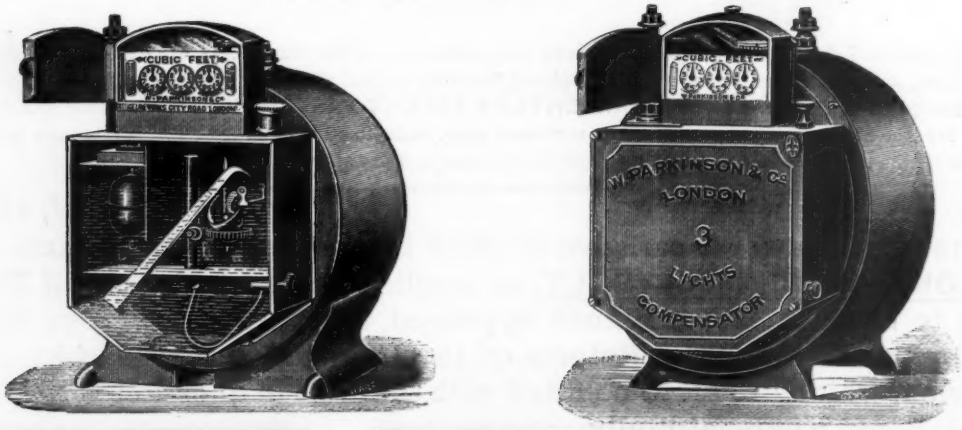

WET METERS
IN TINPLATE OR CAST-IRON CASES

COMBINE THE FOLLOWING IMPORTANT IMPROVEMENTS:—

Parkinson's Patent Three-Partition Measuring Drum { *Ensures perfect accuracy of measurement with the least possible friction, works with the greatest ease, and is free from complication of any kind.*

Slow-Spoon Compensator { *Maintains an unvarying Water-line without any appreciable friction, and provides a large reserve of Water. Has stood the test of Time.*

Enclosed Float { *Allows sudden or excessive pressure on the Inlet without affecting the working of the Meter, or extinguishing the Lights.*

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NOTICE TO SUBSCRIBERS
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THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JANUARY 8, 1889.

THE QUESTION OF THE GAS INSTITUTE.

THE first question which confronts gas engineers now, at the beginning of the New Year, is that of The Gas Institute; and it is advisable that the subject should be clearly understood by all whom it may concern, in order that nobody shall act with inadvertence, or without fairly realizing the issue, when he decides upon his own course of action. The question of the Institute at the present moment is that of its own life or death—an issue which every member is called upon to control, in his degree. The condition of the once prosperous and united organization is desperate, and can only be dealt with by equally desperate remedial measures. Before stating and discussing these, however, it will be desirable to recapitulate some history and facts which require to be borne in mind by anyone approaching the matter in the needful judicial spirit. The Gas Institute, formerly known as the British Association of Gas Managers, was established to represent the art and industry of gas supply, by gathering together in one body its practitioners of every degree. The work of such a society is performed through two different channels meeting in a common end. These are, the influence of the Association upon its members, and the impression it makes upon the community in general. For many years there was no indication that The Gas Institute fell short of what such an organization ought to be. Its annual meetings were looked forward to with pleasure by all members who could by any means make it convenient to attend, if only for a day. Its transactions were regarded with interest; and if any papers did not happen to be quite up to the average, they were accepted with even too much good humour. Old friendships were renewed, and fresh ones made, at these meetings; the opportunities supplied by the dinner and the excursion, for these social pleasures, being highly valued. The presidency was an honour fully appreciated by the leaders of the industry; and the roll of Past-Presidents from 1864 shows that there was no difficulty in finding suitable men for the post. The chief complaint of those who had the interest of the Institute at heart was the happy-go-lucky way in which the great bulk of members took their responsibilities in respect to their own government. The number of ballot-papers filled up was notoriously small, in comparison with the number of members attending the meetings; everything being left to the Council. Ten years ago, in 1878, when the then British Association of Gas Managers met in London under the presidency of Mr. Corbet Woodall, the old *régime* presented a business-like devotion to work which these latter days have given only too much cause to regret. There were fourteen good papers, besides the Presidential Address—all got through in two days, with the exception of one which was taken as read. There were then 666 members of all classes; and the governing body was fairly representative. In those days, there was no question of parties or "cliques" among the members. A good man was recognized as such, wherever he came from; and regularity of attendance at the meetings, and readiness to further the objects of the Society, and to contribute interesting matter to its Transactions, were the only claims to recognition and advancement. Unfortunately, matters soon afterwards changed for the worse. A "dead-set" at the Secretary was made by some members; and there was a marked development of clannishness among members hailing from different districts, who hung together in a way not at all conducive to all-round good-fellowship. The subsequent remodelling of the organization seemed to awake in many members a keener sense of their privileges in the matter of government; which was a good thing in itself, but was liable to abuse in the direction of aiming at disproportionate power. Members in some districts agreed to "plump" to get representatives on the Council; and this policy, rendered possible by the apathy of other members, has, in some instances, resulted in pushing into prominence men of small professional standing, and whose names would never or rarely arise as authors of technical papers, or speakers in useful discussions. Meanwhile, there was a progressive expansion of the influence of traders upon the meetings. Contributions, degenerating into a kind of blackmail, were levied in the name of the Institute from manufacturers and merchants, for the entertainment of members at country meetings; and great uneasiness was given in this way to some of the more thoughtful and self-respecting among the members, who foresaw that such a course must do harm. The practice formally ended with the meeting of 1885; but it has since been continued in an even more objectionable shape. Traders—sometimes singly, sometimes in groups—have made the meetings an excuse for forcing their scarcely disinterested hospitality upon members in various ways. The consequence has been that, although the names on the roll are more numerous, the actual attendance of members at the business meetings is less than it was years ago. There has been during the last few years a throng at the reading of the President's address; and thereafter the technical transactions have been followed by a minority of members. The innovation of sitting only during the mornings, giving up the afternoons to excursions, has not decreased

the tendency of many members to spend the time allotted to the meetings any way but in the hearing and discussion of papers. London does not notice the doings of one particular crowd among its millions; but the comments of the organs of public opinion published in other cities where the unwieldy Institute has recently met, have not been flattering to its dignity.

Then, amid all these workings of the two disintegrating and degenerating influences—clannishness on the part of men from one or two districts leading naturally to repulsion on the part of others, and insidious corruption by traders—came the Bray affair. The Institute undertook in its representative capacity to co-operate with the Directors of the Crystal Palace Company in getting up a competitive Gas and Electric Light Exhibition, at a time when the strongest efforts were being made to detach capital from the gas industry and attract it to the new rival. If the same circumstances were to be repeated to-morrow, we should take up the same position in regard to this policy that we assumed in 1882. Unfortunately for everybody, Mr. George Bray, of Leeds, was one of the exhibitors upon this occasion; and because he did not succeed in carrying everything before him as he wished to do, he made himself intensely disagreeable all round. He went to law with the Crystal Palace Company, and had a costly and altogether unsatisfactory Chancery action with his more successful rivals, Messrs. W. Sugg and Co.; and then, several years later, he sought to make the Institute responsible for all his disappointments in connection with the Exhibition, singling out several conspicuous members and the Secretary as the special subjects for his animadversions. He would not take his alleged grievances into Court; and those whom he assailed, rightly or wrongly, declined to defend themselves by legal process. He thereupon treated his own unproved assertions as admitted facts; and by pamphlets and through various newspapers of the class which is open to exploit personalities of the kind, he has for years done his utmost to sow dissension, distrust, and jealousy broadcast among members of the Institute, as well as vilifying individuals. Large sums of money, extraordinary patience, limitless time and trouble, must have been devoted by Mr. Bray to this pursuit; and in the end he has succeeded in making himself so objectionable that rather than be associated with him, and failing through a legal quibble to get rid of him, the members of the Institute distinguished by his hatred, together with their friends, have quitted it, and thus most effectually taken away its representative character.

All the detailed circumstances of these proceedings are fresh and familiar to our readers. They know through our recent issues how The Gas Institute, which was constituted at the last meeting (according to rule) with a governing body composed of a President, three Vice-Presidents, two Ex-Presidents, a Finance Committee of three, three Trustees, twelve ordinary Members of Council, and a Secretary, is now left with six Members of Council. We have nothing to say against these gentlemen individually; but we have already expressed our doubt of their being able to carry on the Institute even if they fairly represented the national character of the organization—which they do not. Their recent proceedings, moreover, do not give one a high notion of their combined administrative capacity. To begin their rule by appending the name of a colleague to a declaration of policy without his knowledge or consent is a greater blunder than the old Council ever committed. Their elevation of one of their number to the position of President *pro tem.* is altogether unwarranted. They may choose a Chairman; but the title and office of President are as beyond their power to bestow as of anyone to assume without proper election. Without more than referring to the disingenuousness of the Council's circular of Dec. 21, as exposed by the late President in our last week's issue, we come to this conclusion: That all the actions of the fragmentary Council since the majority of their colleagues resigned, have been *ultra vires*. There is no power under the rules for dispensing with the governing authority therein defined; and the only legal step for the Council to have taken in July was to have declined to receive the resignations of their colleagues until an extraordinary general meeting could have been convened to recall or replace them. Every cheque signed and other executive act done since then, is on the individual responsibility of the persons involved in it, until and unless they are indemnified by the general body of members. Certainly they are not justified in doing any but the most necessary acts.

What then is the position? The Institute is smitten with paralysis. It may drag on a more or less protracted existence, even as a kind of enlarged Manchester District organization; but representative it can never be again. It named its most representative members to act in concert with the Crystal Palace Directors in 1882; and these have left it. There is no blowing hot and cold in a matter of this kind. If these gentlemen were representative men in 1882, they are the same in 1889. They have quitted the Institute, with which they could not in honour remain identified; but they are not going to efface themselves. Mr. Hunt's letter in last week's Journal, and Mr. George Livesey's to-day, are authoritative upon this point. Those who believe or pretend to believe that considerations of mean self-interest prompt the formation of a new, purified, and truly representative association, on the ruins of the old, confess what would be their own motives under such circumstances, and "measure others by their own standard." The argument for the immediate establishment of a truly representative society in connection with the gas industry, which Mr. Livesey states to-day, is conclusive. The industry is too great to go without an organized body and an authoritative voice, especially in these days, when eager eyes are on the look-out for the least sign of weakness or decadence in its partizans and its fortunes. This is no time for vain dissensions, small jealousies, and idle recriminations. If the old organization was divided and erected on a rotten foundation, drop it and make a better one. If we cannot mend the old, let experience guide us in building up the new. This is the spirit in Mr. Hunt and Mr. Livesey; and it will find wide sympathy. Let the old Institute die with all its mistakes, shortcomings, and irritations; and let its successor be strong, united, wide-based, and inaccessible to the influences that have wrecked its predecessor. There may be disappointments and heartburnings for awhile; but these will grow dull and vanish in time under the operation of a generous amnesty such as will certainly not be wanting in the founders of the new Society.

GAS AFFAIRS AT LEEDS, HALIFAX, AND SALFORD.

In last week's Journal, we published a mass of matter respecting the positions occupied by the Leeds Gas Committee and Mr. Ellis Lever; and in another column we now give in full the rejoinder addressed by Mr. Lever to Sir Geo. W. Morrison, the Town Clerk, upon the report of the Sub-Committee appointed to investigate his charges. We shall not attempt to summarize this reply, except to remark that the prevailing impression as to Mr. Lever's being satisfied with the analyses of the coal, the quality of which was called in question by him, turns out to be erroneous. At the last monthly meeting of the Town Council, the Mayor evidently thought that the affair of the gas coal was finally settled; for he congratulated the members of the Council upon the fact that "Mr. Lever had been unable to substantiate the charges he had made against certain contractors of coal to the Corporation; and that the Gas Committee had come out so well." Mr. Lever does not look upon the matter in the same light, however, and declares that the whole investigation has been illusory, and that the ratepayers of Leeds are still being defrauded. It is impossible to say where assertions and counter-assertions of this kind may end. A disputant who is driven out of one corner may take refuge in another; and the public, who only read about these things in the newspapers, go away with an uncomfortable suspicion that they are being tricked somehow. It is a pity that all such irregular controversies cannot be placed within the grasp of a Court of Law, where evidence can be sifted and assertions tried by accepted touchstones. This coal business is not the only trouble in connection with the Leeds Gas Undertaking, the economical administration of which is so greatly admired in some quarters. Alderman Sparks is under the impression that there has been some "hocus-pocus" about the make and distribution of the gas; and there was a proposal to consult Mr. Lloyd, who not long since left Leeds for more comfortable quarters at Bristol. We do not know whether Mr. Lloyd had cherished the remembrance of snubbings received (and perforce endured) while under the Leeds Gas Committee; but his reply to their communication was very like a repayment of an old score. He gave the Committee to understand that he was no longer to be considered as at their beck and call; whereupon his response to their overture was denounced as "insulting." It is remarkable how very tender of their own dignity members of Local Authorities can be when they like; and how completely they can occasionally forget it in dealing with their officers. On the whole, the management

of a gas undertaking "on the cheap" has not brought much more comfort to Leeds than it has to Manchester.

This will be a convenient place to notice the course of events at Halifax and Salford. There is apparently something brewing in the former place in connection with a controversy between the Mayor and Messrs. Storey and Co., the Solicitors for Mr. Carr, over the late trial. Smarting under the well-aimed reproaches of a local newspaper, the Mayor was injudicious enough to review the dismissal of the case, and to assert that, if the Corporation had been allowed to go on, evidence would have been given to justify the prosecution. Seeing that evidence which has not been tested by cross-examination is worthless, this was a rash challenge to Mr. Carr's friends; and Messrs. Storey and Co. accordingly responded by unmasking a little—only a little—of the battery they had prepared for the Corporation "expert" witnesses, and which we believe they much regret their inability to use. What is the nature of the further steps which Messrs. Storey threaten in a local newspaper to take, we are not in a position to indicate. We can only hope that something will be done, without unnecessary delay, to clear up the muddle which the result of the late trial of Mr. Carr only left more hopeless than ever. At Salford, Mr. Ellis Lever has returned to the charge, and has offered to disclose the secrets which are such a burden upon his mind to a Select Committee consisting of three Councillors and the Mayor, provided that these communications are to be regarded as strictly confidential and privileged. Subject to the establishment of an understanding as to how information so guarded can be made useful, the offer has been closed with; and the world now waits to see whether Mr. Lever will go on. It is high time these matters were cleared up, and the Salford Gas Committee permitted to address themselves to the future, instead of dwelling so exclusively upon the past.

THE MANCHESTER GAS COMMITTEE AND THEIR BRADFORD ROAD STATION.

The Manchester Corporation are not quite comfortable under the exposures that have recently appeared in the columns of the Journal and elsewhere of their blundering and wastefulness in regard to the enlargement of their gas undertaking by the construction of the Bradford Road station. Alderman Sir John Harwood is no believer in these works; and at the last monthly meeting of the City Council, when there was a short debate on the subject arising out of an inquiry as to Mr. J. Woodward's position at the station, he took occasion to repeat his views. Alderman Asquith said that Mr. Woodward was not Manager, but merely Foreman—temporarily appointed to look after the men employed on these works. If he is only a Foreman, to whom, may it be asked, is he responsible? The answer must be, to the Committee; to which it may again be asked, how he differs from any of the other Station Managers? If Mr. Woodward is only a Foreman, it looks very much as though the Gas Committee were bent upon carrying their policy of dispensing with responsible agents yet one more step. They have pottered along for many years without any responsible head capable of managing their great undertaking as a whole; and now they think they can do without Station Managers, and rely upon Foremen! Truly, the Manchester Gas Committee offer a spectacle to gods and men. They do not know when they have made the most out of their old works; and so they buy land and build another station, which even now, after the lapse of a dozen years, is denounced as unnecessary. They are told that a little more gasholder room was all they wanted; but not having an Engineer to advise them upon these matters, they scarcely knew what to say. Altogether, the position of the Manchester Gas Department, as a model of economy in the administration of their trust, has been badly shattered during the past few weeks. The ratepayers are, of course, helpless and ignorant in the matter, or they would turn out all the members of the Gas Committee who have been identified with the existing system of administration, and appoint fresh men, of business capacity, with instructions to obtain the best advice to be got for money, as to how the mistakes of the past can be repaired and the gas-works converted from a scandal into a credit to the city for the future.

Mid-Sussex Water Company.—We are pleased to be able to congratulate the Directors and shareholders of the Mid-Sussex Water Company on the gratifying success which has attended their search for water at Balcombe; inasmuch as a large supply has been tapped within 100 feet of the surface.

Water and Sanitary Affairs.

The waste of water consequent upon imperfect fittings in the houses of consumers, is a matter in which public as well as private interests are concerned, especially where the constant supply is in operation. An efficient check to this abuse is needed on sanitary as well as commercial grounds; and although the power possessed by the Water Companies, of cutting off the supply where the fittings occasion waste, is objected to as prejudicial to health, the case as it affects the community would be far worse if no corrective could be applied; for no quantity of water sent into a district would be sufficient for its real wants if waste were allowed to proceed uncontrolled. Moreover, waste reduces pressure, and limits the supply to the higher levels. As the greater part of London is now receiving a constant supply, the absolute integrity of consumers' fittings is rendered more than ever important, and increasingly so as the system is extended. The question becomes still more acute when studied in the light of the recent Local Government Board report, expressing doubt as to the adequacy of existing resources to provide a sufficient supply of water to the rapidly increasing population of London and its suburbs in hot weather during future years. But despite these considerations, the Metropolitan Water Companies are apparently content with the powers which they possess for preventing waste, besides having provided themselves with excellent means for detecting this evil by the use of Deacon's waste-water meters. It is not to the interest of a Company to cut off the supply from a customer who pays his rate, unless the water is running away to no purpose. The object of the Company is to prevent waste, and keep their customer. But the fact is that the mere threat to cut off the supply is in nearly all instances sufficient to bring the delinquent to his senses, whether the defaulter be tenant or landlord. The cases in which it is found necessary to proceed to extremities are exceedingly rare. One such occurrence will be blazoned forth in the newspapers as though it were representative of numberless other instances; and hence an exaggerated notion of the subject possesses the minds of the public and of the authorities. The Clerkenwell Vestry propose that the Companies should be deprived of their power to cut off the supply where the fittings are defective; and having gained the concurrence of other Metropolitan Authorities, have requested Captain Penton, the member for Central Finsbury, to introduce a Bill into Parliament empowering the Companies or the Local Authorities to carry out the necessary works in cases of waste, and to recover the cost from the owners. Captain Penton has consented to bring in a Bill for this purpose in the ensuing session. Supposing the Bill to pass in such a form that the Companies may be sometimes under the necessity of executing the works, the process of recovering the expense will place them in the position of collectors of tradesmen's accounts; and, of course, it will often be alleged that they have run up the account with fittings unnecessarily expensive. If the Local Authorities do the work, the Companies may have reason to complain that it is not done properly; and it is difficult to see where their remedy will lie. The present law may seem rough-and-ready, but it is at least effective; whereas the system now proposed threatens to introduce complications which cannot fail to be a source of weakness. Cases for interference will be multiplied; and it is not apparent that anybody will be benefited. One inevitable result appears to be that of a divided responsibility, and the imminent risk of a quarrel between the Companies and the Authorities.

Oil Lighting at Erith.—A local correspondent writes: "The Erith Local Board have drawn the 'serious attention' of Messrs. Defries to the large quantity of oil which leaks from the reservoirs of their lamps at Erith, to which reference has already been made in your columns. The new broom is getting a little worn already; and oil lighting will certainly not be permanent at this place."

The Progress of the Institution of Civil Engineers.—The following table shows the growth of the Institution of Civil Engineers during the last decade and the past twelve months, the date given—Jan. 2—being that of the establishment of the Institution in the year 1818:—

	Jan. 2, 1879.	Jan. 2, 1888.	Jan. 2, 1889.
Members	1081	1596	1638
Associates	1717	2855	3003
Honorary members	16	20	18
Students	535	947	957
Totals	3349	5418	5616

Essays, Commentaries, and Reviews.

THE AFFAIRS OF THE GAS INSTITUTE.

The crisis in the affairs of The Gas Institute is still in its most acute stage; and the following letters and communications will enable our readers to perceive how matters are likely to develop. The first to be noticed is the circular which has been issued by Mr. George Garnett and Mr. William Longworth, in the name of the fragmentary Council. There are several curious points in this production besides the conflict between some of its statements and the further explanation which Mr. Henry Woodall gives of his views. Mr. Garnett will have much to do to clear himself of the charge of inconsistency brought against him by the late President, and to persuade observers that the bait of the presidency which he has now taken had nothing to do with his later action. Mr. Woodall easily defends himself from the ascription in the second paragraph of the circular, of desiring an "extraordinary general meeting of members at this time of the year." If the remaining members of Council had only agreed with the late President's views, or had been less strenuous in insisting upon carrying out their own ideas on the question of policy, the members generally need not have been troubled to meet or record their opinions until June. The fact seems to be that the five Manchester District members early saw their way to combined action apart from their colleagues, and formed a close union for this purpose. They obtained the adhesion of Mr. Garnett, and were then numerically strong enough to carry anything against the President and the others, who were driven to resign rather than be called upon to endorse resolutions taken outside and brought in "cut and dried" by the compact little majority. The attempt to fix upon the late President the odium—for such it is made to appear—of wishing to hold an extraordinary meeting at an inconvenient time is, therefore, gratuitous; and the remark about keeping the Institute "intact" until the usual meeting, is distinctly humorous under the circumstances. A graver question arises in connection with the reference of the circular to Mr. Stelfox; since it must be felt that the absence of any attempt to explain the unwarrantable use of this gentleman's name in connection with the previous circular does not tend to restore confidence in the existing administration. As the presentment of the present state of affairs and the outlook for the future would have been incomplete without Mr. Bray's proclamation, we have reproduced it. It would be necessary to go a long way to find a parallel to this audacious letter. If, as seems likely, it was written with the object of patronizing the old Institute and frightening people from joining a new one, it would be a pity for it to be hindered in either respect for want of all the publicity that we can give it. Mr. George Livesey's and Mr. Charles Hunt's letters (in another column) state the question for the new association in terms too clear and weighty to require paraphrazing here.

Circular of the Council to the Members.

Gas-Works, Guildford, Dec. 31, 1888.

Dear Sir,—In fulfilment of the promise made in the circular dated the 21st inst., we are requested to acquaint you with the result of the Council meeting held in London, on Saturday, the 29th.

Your Council are still of opinion that they would not be doing their duty to the members, in recommending that The Gas Institute should be dissolved, until the members have had an opportunity of deciding on the matter; and that it would be most undesirable to hold an extraordinary general meeting of the members at this time of the year. They have, therefore, decided to continue the Institute intact until the annual general meeting in June next; and with a view to this, have unanimously appointed Mr. George Garnett, M. Inst. C.E., President, *pro tem.*, and Mr. William Longworth, Assoc. M. Inst. C.E., Honorary Secretary, *pro tem.* They have resolved that Mr. Alfred Lass, F.C.A., be engaged to arrange and complete the transfer of the books and property of the Institute, now in possession of Mr. Bennett, the Secretary. It was also decided that all subscriptions and communications relative to The Gas Institute be forwarded to Mr. William Longworth, Gas Offices, Guildford.

A letter was received from Mr. Stelfox, stating that, "as it is quite impossible for me to attend [the above meeting], and the business of the Institute at present should be in the hands only of those who can take an active part in its transactions, I think it is my clear duty to resign my seat on the Council. I trust the result of your deliberations will be to promote the interests of the Institute in the future."

In conclusion, the Council hope the members will approve the policy now adopted, and will assist in preserving an Institute which has, on the whole, been so beneficial to the interests of the gas industry.—We are, Dear Sir, yours faithfully,

George Garnett, President, *pro tem.*
William Longworth, Hon. Sec., *pro tem.*

Letter from Mr. James Stelfox.

Belfast, Jan. 2, 1889.

Sir,—Last Thursday evening (27th ult.) I received a notice to attend a meeting of the Council of The Gas Institute in London on the following Saturday. Finding it quite impossible to leave home, and having had to excuse myself on two previous occasions within the month from attendance at meetings of the Council, I felt I had no alternative, and must resign my seat. I accordingly forwarded my resignation, and wired to Mr. Veevers (by whom the notice was signed) that I had done so.

On Friday, I received a copy of the circular which has been apparently sent to the members of the Institute. This was enclosed without note or comment, and I think it is due to myself, and the members of the Institute generally, to say that the use of my name was quite unauthorized, and that I knew nothing whatever of the circular till I saw it in print.

James Stelfox.

Letter from Mr. Henry Woodall.

Westminster, Jan. 5, 1889.

Sir,—In a communication from Mr. Bray which appears in the *Gas World* of to-day's date, it is stated that "the reason for the President's retirement will shortly have other light thrown upon it than that contained in his letter."

It seems to be suggested in this paragraph that, when writing the letter referred to, I withheld something that was material to the situation. I shall, therefore, be glad if you will permit me to make good the only deficiency which occurs to me, by stating that, of the two policies discussed by the Council, mine was to wind up the present Institute, and straightway to form another, to which no traders should be admitted. Correspondence from many quarters had indicated this policy as the one which would reconcile the great majority of members; and as it was complimentary to the Manchester District Institution, which has always rigidly enforced the principle, it needed but the assent of those on the Council who were also members of the Manchester Institution, to have gained for it an almost universal acceptance. It was the unexpected that happened!

Elsewhere, in the same publication, I am credited with forgetfulness of an expression which is put into the following words, "I will stick to you [*i.e.*, the Council] whatever happens." Now when I first made that promise, the Council consisted of ten members. After a little while, Mr. Colson retired; but not before Mr. Garnett had expressed himself as follows:—"I can speak for the South-Western Association; and I say that, to a man, its members are in favour of the entire exclusion of all traders, at whatever sacrifice." At a subsequent meeting, the unexpected happened again. Mr. Garnett forgot his obligations to the Association of which he is a Past-President, and voted with the majority. Two or three days later, Mr. Cross and Mr. Peaty retired. Now can anyone seriously contend that I was to hold myself still bound by promises made under such widely differing circumstances?

I should like further to state that the special meeting which I proposed to call, was to give the members the opportunity of voting upon the proposal to wind up. It was no part of my proposal that this meeting should be called during the winter; and it was, of course, within the power of the Council to determine that it should be held in June.

H. Woodall.

Letter from Mr. George Bray.

To the Editor of the "Gas World."

Sir,—In view of the events occurring in rapid succession in connection with The Gas Institute, it will probably be convenient to many parties if I break silence. I, therefore, beg to say:

(*a*) That the reason for the President's retirement will shortly have other light thrown upon it than that contained in his letter, which I read in the *Gas World* on Saturday last.

(*b*) That I hope the well-disposed members may be strong enough to preserve what is good of the Institute, and to keep out rigidly the baneful element which I have succeeded in eliminating. If they do so, they will receive no opposition from me.

(*c*) As there have been suggestions made, and much scheming done, with the object of forming a new and rival Gas Institute, by the obnoxious element which has been eliminated from the old Institute and their partizans, I wish to say that I have not yet finished with those conspirators and their villainies, and that if they succeed in forming a rival Institute, they and their Institute will have me to deal with, and will find that what has hitherto been done is a small matter compared with what will be done.

(*d*) I trust the members generally, who have suffered so much by every move in the policy of the late wire-pullers, even to the extent of having been repeatedly denounced at public meetings by Mr. Geo. Livesey, the leader of those wire-pullers, and by the reptile organ of the clique as being almost universally corrupt, will not aid them to form a new Institute, in which, of course, they would arrogate to themselves and their parasites the positions of influence and power.—Yours, &c.,

George Bray.

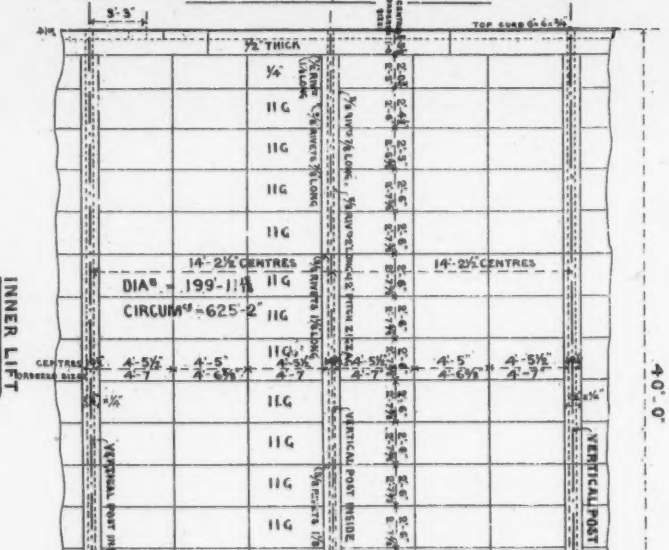
Leeds, Jan. 3, 1889.

The returns of Joint Stock Companies at Somerset House for the year just ended are phenomenal. The aggregate capitals amounted to more than £400,000,000, as against £168,000,000 in 1887. The returns for the month of December give capitals in the aggregate of £12,232,030, an amount which accounts for 102 Companies.

Mr. John Aird, M.P., has revived his suggestion that an International Exhibition should be created for 1891 (following the lines of the Great Exhibition of 1851), to be held in the Crystal Palace. The associations would, he says, be very happy. No building could be more suitable; and, if carried out at moderate cost, it would prove a great national and financial success. The building could, doubtless, be secured for the required time, and upon reasonable terms; and in the gardens temporary erections to any extent might be economically and readily constructed. What an overpowering sight it would be, he remarks—this grand building and its various annexes filled again, after an interval of 40 years, with the world's productions and goods, arts and industries; and this in the home where the first exhibition of all was created.

ELEVATION OF 1 BAY OF EACH LIFT

LOOKING AT OUTSIDE OF GASHOLDER.



DESIGNED & CONSTRUCTED BY
C. & W. WALKER

INNER LIFT

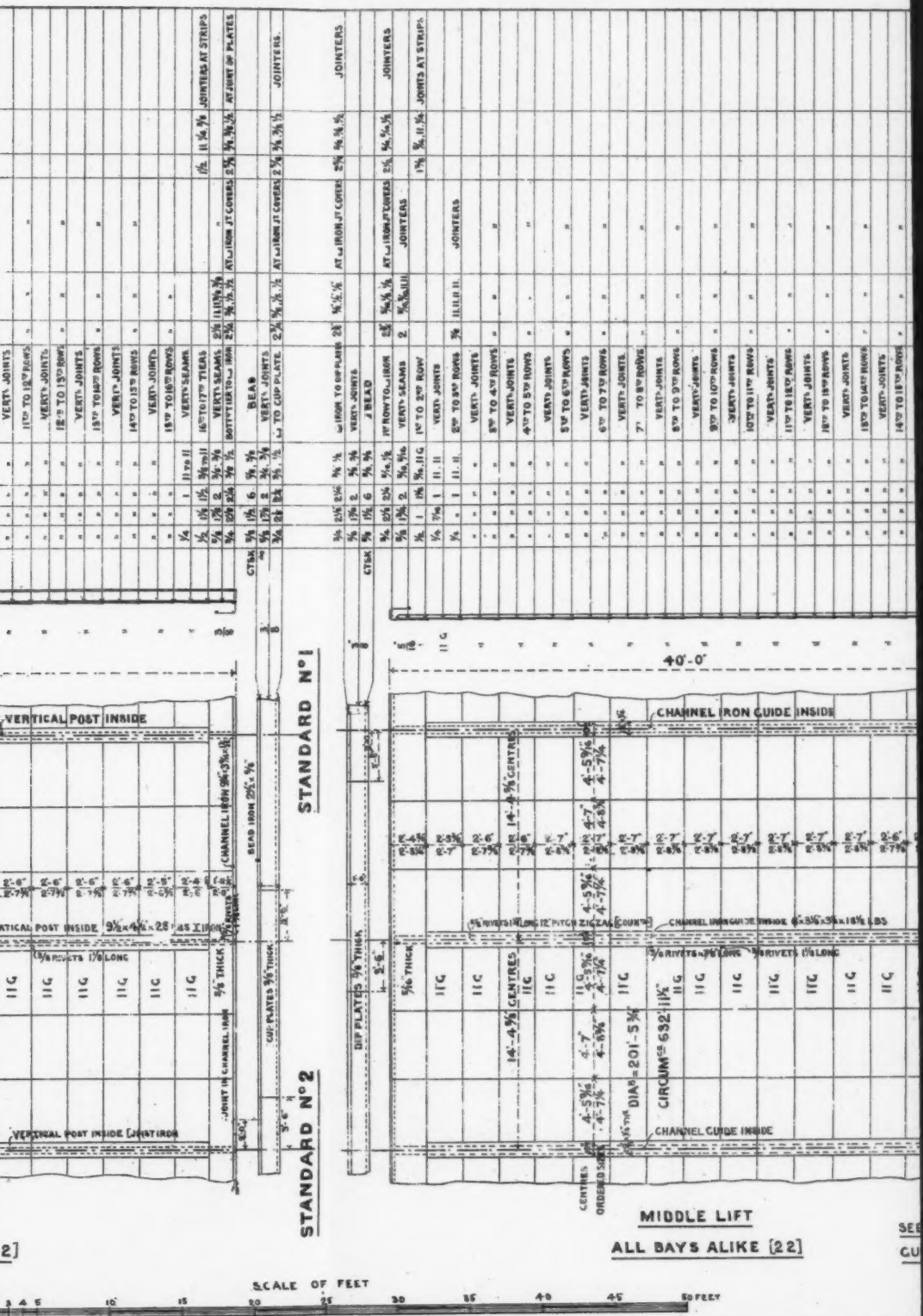
ALL BAYS ALIKE [22]

TABLE OF RIVETTING TO SIDE SHEETS.

DIA^S	LENGTH	PITCH	THICKNESSES	WHERE FOR	LENGTH	THICKNESSES	WHERE FOR	LENGTH	THICKNESSES	WHERE FOR
ZIG ZAG	⅞"	2⅜"	¾" ⅝"	TOP CURB	3⅝"	⅝, ⅞, ½"	AT JOINT COVERS	3½"	⅝, ½, ⅝"	AT JOINTS & PLATES
	⅞	2¼	2¼	½ - ⅝	VERTICAL JOINTS			2¼	½, ½, ⅝	JOINTERS AT ½ PLATES
	⅞	1⅞	⅞	⅝ & ½	11^TH TO 2^ND TIERS	10½	⅝, ½, ⅝	JOINTERS ⅝ PLATES		
	⅞	1⅝	1⅝	½, ½	VERT^L JOINTS	1½	⅝, ½, 11	JOINTERS	1½	⅝, ½, 11	JOINTERS AT STRIPS
	⅞	1⅜	1⅜	½, 11G	2^ND TO 3^RD TIERS				1	⅝, 11	
	¼	7/16	1	11 TO 11	VERT^L JOINTS						
	"	"	"	"	3^RD TO 4^TH TIERS	3⅛	11, 11, 11	JOINTERS			
	"	"	"	"	VERT^L JOINTS						
	"	"	"	"	4^TH TO 5^TH ROWS	"	"				
	"	"	"	"	VERTICAL JOINTS						
	"	"	"	"	5^TH TO 6^TH ROWS	"	"	"			
	"	"	"	"	VERT^L JOINTS						
	"	"	"	"	6^TH TO 7^TH ROWS	"	"	"			
	"	"	"	"	VERT^L JOINTS						
	"	"	"	"	7^TH TO 8^TH ROWS	"	"	"			
	"	"	"	"	VERT^L JOINTS						
	"	"	"	"	8^TH TO 9^TH ROWS	"	"	"			
	"	"	"	"	VERT^L JOINTS						
	"	"	"	"	9^TH TO 10^TH ROWS	"	"	"			
	"	"	"	"	VERT^L JOINTS						
	"	"	"	"	10^TH TO 11^TH ROWS	"	"	"			
	"	"	"	"	VERT^L JOINTS						
	"	"	"	"	11^TH TO 12^TH ROWS	"	"	"			
	"	"	"	"	VERT^L JOINTS						
	"	"	"	"	12^TH TO 13^TH ROWS	"	"	"			
	"	"	"	"	VERT^L JOINTS						
	"	"	"	"	13^TH TO 14^TH ROWS	"	"	"			

SYDNEY GASHOLDER.

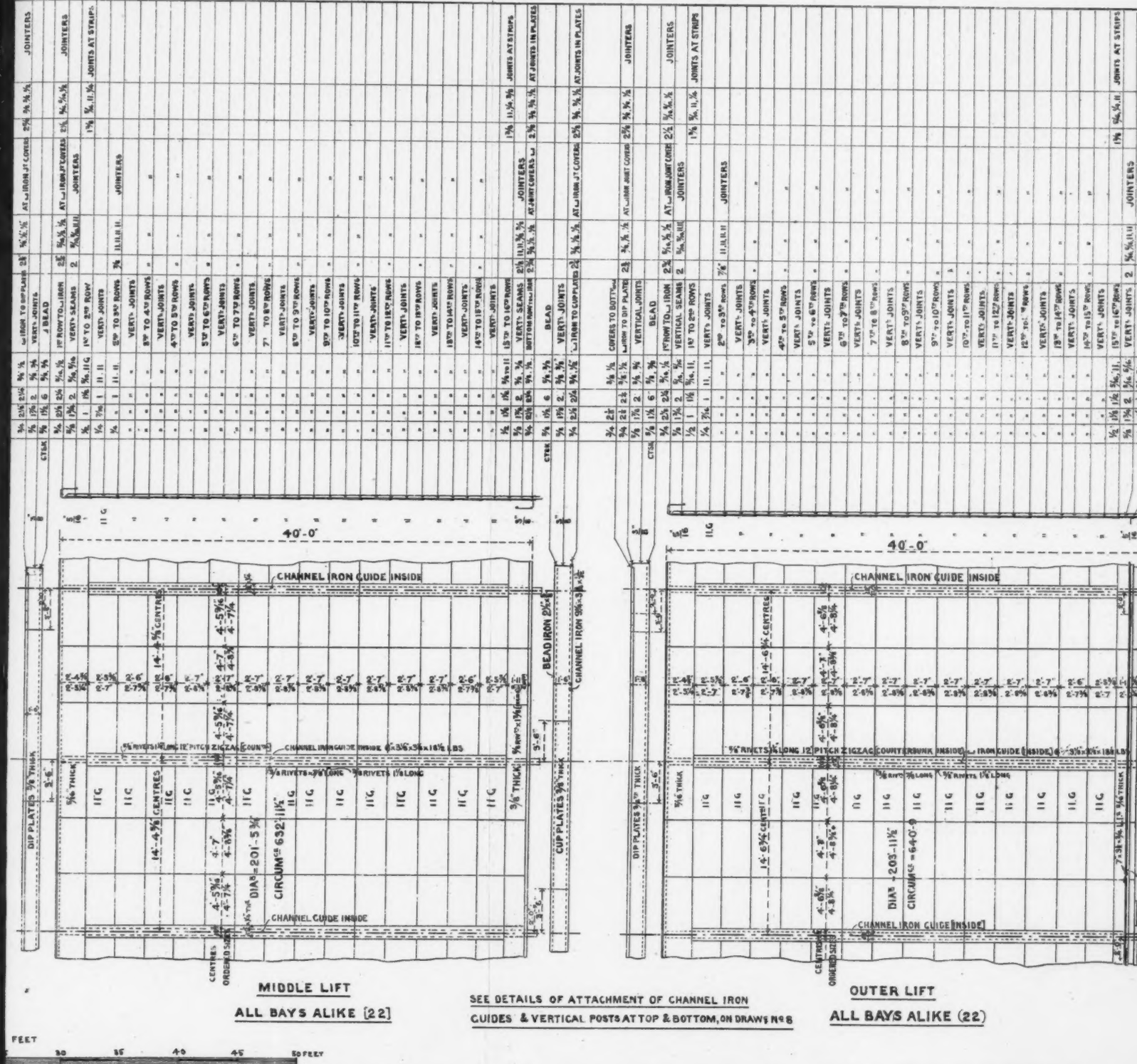
DIAGRAM OF SIDE SHEETING.



SYDNEY GASHOLDER.

DIAGRAM OF SIDE SHEETING.

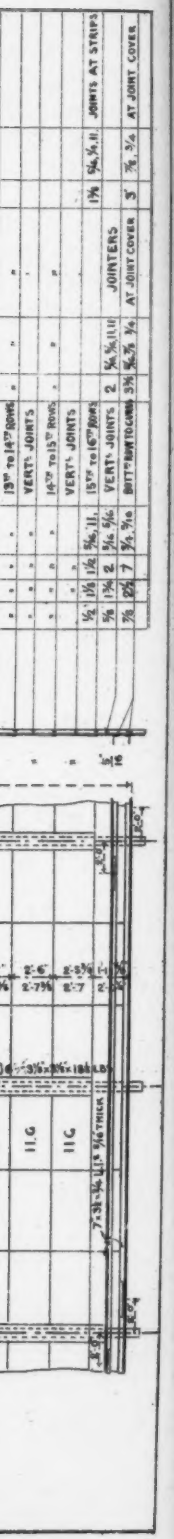
DRAWING NO 6



SEE DETAILS OF ATTACHMENT OF CHANNEL IRON GUIDES & VERTICAL POSTS AT TOP & BOTTOM, ON DRAWG No 8

KING, SELL & RAILTON Ltd., Printers, 12, Gough Square, Fleet Street, London, E

NC NO 6.


JOINTERS
AT JOINT COVER
JOINTS AT STRIPS
AT JOINT COVER
VERT. JOINTS
BITT. MAT TO CURB
VERT. JOINTS
11 G
11 G

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 81.)

The new year opened under fairly favourable circumstances. The Money Market has attained a condition of ease very different from that which was pretty generally anticipated a few weeks ago; and indeed in some quarters a reduction in the Bank Rate is confidently looked for. The Stock Markets during the past week (which was broken by a close holiday on New Year's Day) have on the whole been tolerably strong; though not without their fluctuations, especially those which are mainly influenced, if not controlled, by foreign exchanges. With things quiet at home and abroad, the general tendency should continue favourable. The Gas department has inaugurated the new year with a considerable access of strength, and a marked rise of prices—especially in the leading stocks. Business has been more brisk and active than it has been for some weeks past. The chief advances are in the principal issues of Gaslight. On Monday, Gaslight "A" was marked at 250½; but from that point it rose steadily until on Saturday it was done at 255—the quotation showing an upward move of 3, which might easily have been made a little more. The 10 per cent. preferences have made a considerable advance; the "J" rising 3¼, and the rest 2¼. The "H" has also gained 2. South Metropolitans have been in good demand, and have been pretty active almost every day, and prices have gone up materially. Nothing at all has been marked in Commercial; but, for all that, good money is being put into it for investment, and the price is very favourable for buyers. There have been many transactions in Imperial Continental; and the quotation has risen 3. In other Companies there has not been much business, except in Continental Union; but many quotations have advanced, the details of which will be found in the list at page 81. Business in the Water department has been extremely quiet; but it shows that nearly all issues are strong. Kent has risen 2; West Middlesex, 1½; and East London, 1. The only exception is Southwark and Vauxhall, the ordinary shares of which have fallen 1. These, however, are more subject to fluctuations than the others, and appear to rise and fall independently of the general tendency.

The daily operations were: Very quiet business in Gas and Water on Monday; and—as might be expected on an odd day standing between holidays—prices were not well supported. But no quotations fell. On Wednesday, the business of the new year opened quite lively, principally in Gaslight "A" and Imperial Continental, though South Metropolitan also showed out well. An advance of 1½ was made in Brentford new; 1 in Gaslight "A," and in all the 10 per cent. preferences; and ¼ in Bombay. Sydney was ¼ better, on *ex div.* quotation. Nothing was done in Water; but East London, which had showed strength on Monday, rose 1. Increased firmness in Gas was the note of Thursday, with a rise of 2½ in Gaslight "J," and 1½ in "C" "D" and "E;" 1 in Bromley old; and ¼ in Bromley new. The only business in Water was done in Kent, which rose 2. Southwark ordinary fell 1. Friday found Gas still very buoyant. Business was largely in the more rarely handled Foreign undertakings—Bahia, Cagliari, and (especially) Continental Union preference. The improvements, however, were marked in Gaslight "A" and Imperial Continental (which rose 2 each) and South Metropolitan "B" (which rose 1½). Water was quite neglected; but West Middlesex improved 1¼. Saturday was quiet; but quotations were still on the rise. South Metropolitan "A" advanced 2; the "B," 1; Imperial Continental, 1; Gaslight 6 per cent. debenture, 2; and the "H," 2. In Water, New River changed hands at good figures; but the quotations underwent no variation.

ELECTRIC LIGHTING MEMORANDA.

THE BOARD OF TRADE AND MR. R. HAMMOND ON METROPOLITAN ELECTRIC LIGHTING SCHEMES — PROGRESS OF THE METROPOLITAN ELECTRIC SUPPLY COMPANY—ELECTRIC LIGHTING AND ARCHITECTURE.

In our news columns to-day will be found the correspondence between Mr. H. G. Calcraft, of the Board of Trade, and Mr. Robert Hammond respecting the granting of Licences and Provisional Orders, under the Electric Lighting Act, for Metropolitan districts. The announcement, apparently inspired, was made in last Wednesday's London newspapers to the effect that, as the Board of Trade had decided not to grant Licences for the supply of electricity in Metropolitan districts, all applicants must proceed by way of Provisional Order, which would give an opportunity for the immediate supervision of Parliament. Upon this Mr. R. Hammond wrote to *The Times* to show that the only ground for such a sweeping statement as to the intentions of the Board of Trade was a remark dropped by the Chairman of the London Electric Supply Corporation at a general meeting of shareholders, and that it was inaccurate and misleading. It appears from a communication of Mr. Calcraft to Mr. Hammond, representing the House-to-House Electric Light Supply Company, that the Board of Trade retain their declared opinion respecting the proper relationship of Licences to Provisional Orders—that the former is a class of authorization applicable to small areas and for experimental purposes; while larger areas and permanent undertakings can only be dealt with by Orders. The bearing of this correction is obvious enough. Mr. Hammond's Company aim at creating a business by multiplying small centres of supply, every one of which may be independently licensed; while the London Electric Supply Corporation want to take possession of all London, to the exclusion of such little ventures as are contemplated by Mr. Hammond. This energetic personage objects to be extinguished in any such summary fashion, and indeed turns the tables upon his rivals by pointing out, with irresistible logic, that, so far from not granting Licences, the Board of Trade ought not to concede anything else, because none of the other speculators who are at present clamouring for Provisional Orders, which would put them in possession of London for 42 years, have the necessary experience to warrant their claim. "We smaller claimants for licences," he urges, "only ask for protection in doing what we know we are able to do with reasonable satisfaction to our customers. You others ask for rights over all London for doing what you have never yet tried to do on any scale." It is a most striking argument. There is an old adage which may be interpreted as advising anyone wishing to learn all about the tricks of the trade, to set one tradesman against another. Mr. Hammond has certainly put something in the way of his more pretentious rivals which will give them a great deal of trouble to get over.

The Metropolitan Electric Supply Company, Limited, which is one of the undertakings aiming at taking possession of all London, have held an extraordinary general meeting, at which the Chairman of the Board, Sir John Pender, M.P., made a statement respecting the progress of the Company since last August. The Whitehall installation, which is the nucleus of the Company's business, and is intended to serve as the school for their engineers, just as the Grosvenor Gallery installation has done for the rival London Electric Supply Company, was described as very flourishing. It is said to be capable of supplying 10,000 lamps, of which 9000 are stated to be subscribed for in the immediate neighbourhood. The next station now being organized is to supply 50,000 lights, and take its name from Sardinia Street, Lincoln's Inn Fields, rightly described as controlling a very important district. This is the station, the equipment of which has been ordered of the Westinghouse Company, of Pittsburgh; and the reason stated by the Chairman for thus disposing of their first favours is that the Westinghouse people have put down 116 installations in America, all of which have been successful. It was also stated from the chair that while, judging by the test of success, the Directors regarded the Westinghouse system as the best in existence, they are nevertheless inviting tenders from English firms for the next set of plant to be laid down, in order that the two descriptions of manufactures may be fairly compared. The Company's largest station is to be at Waterloo Bridge Wharf, which is capable of accommodating the machinery for 150,000 lights. Of course, the Chairman shakes his head over the proposed Deptford station of the Company's rivals; but as Mr. Hammond pertinently remarks, all the large talk of these gentlemen is as yet unsupported by any experience in working under statutory conditions.

Somebody has been writing to the Editor of the *Builder* suggesting that, in view of the "strong probability" that electric lighting will soon become general in London and the chief towns of the country, it would be desirable for instruction in the principles of the use of electricity for lighting purposes to be given by the Royal Institute of British Architects and the Architectural Association. The writer remarks that it is manifestly undesirable for such a matter to be left entirely to the electrician, because the application of electricity as a means of lighting, intimately affects the arrangement of a building in such a way that only the designer can properly deal with. The Editor of the *Builder* "quite agrees" with his correspondent in thinking that "practical electricity is a subject which the architect of the future will have to study, and that it ought to form part of an architectural student's curriculum." We have no desire to quarrel with this pronouncement, but would like to ask whether in the meanwhile it would not be advisable for architects to take a little more trouble to understand the lights with which they have to deal in the present? Seeing how little these gentlemen as a body have done to assist the improvement of gas lighting, we have not much hope of their ever doing much good as students of electricity. Nine out of ten of them would rather prate æstheticism any day than see that good light and sweet air are provided for all buildings upon which they may be engaged.

THREE-LIFT HOLDER FOR SYDNEY GAS-WORKS.

Designed and Constructed by Messrs. C. & W. Walker, of London and Donnington.

DESCRIPTION OF DRAWING, No. 6.

We have now to describe the sheeting or skin of the holder, forming the sides and top; then the framing (or stiffening rings and ribs within) which preserves it in true form, and helps to resist the distorting strains; and, finally, the roller carriages for admitting of its easy rise and fall. The present drawing shows one bay of the side sheeting for all three lifts. The drawing is self-explanatory; but as it brings out several important points in construction, we will draw special attention to them.

(1) The number of sheets round the holder is the same in each lift. This brings all the vertical joints of the sheets in the three lifts in line vertically, and gives a much better appearance than if they are allowed to run out as they will.

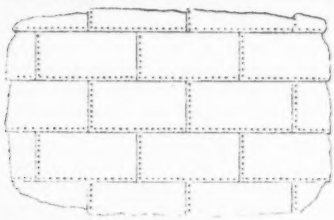
(2) Every bay in the sides is the counterpart of those drawn. The joints in angle-iron curbs, and channel-iron cups, dips, bead iron, &c., all come exactly in similar places in every bay throughout the holder.

(3) Vertical strips are put behind each of the vertical stays, and channel-iron guides. These strips are ¾-inch thick, and so render additional strength and stiffness to the guides, which are rivetted to them all the way up. Without these strips, it is very awkward

to attach the guides all the way up, as they pass over so many joints; and if they are thin sheets rivetted with washers between, &c., they are apt to work loose and leak.

(4) The centre to centre of rivetted joints is given throughout; the centres being arranged to suit the exact number of pitches (because the sheets are all punched in special multiple punching machines, which punch the three sides of any plate up to 6 feet by 3 feet, without disturbing the plate after once setting it on the bed; thus ensuring the lines of rivets being perfectly square with one another). In determining these centre-to-centre dimensions the greatest care is exercised. For instance, the sheets next the vertical strips must be about ½ inch greater in length, centre to centre, than the even number of 1 inch pitches, because of the extra lap at this place, which would otherwise come too close to the nearest rivet. This has always to be noticed when joining a thin plate to a thick one, and is observed in all the joints—vertical as well as horizontal—in this holder. The *ordered* sizes of the plates and sheets are figured below the centre-to-centre dimensions. No joint covers in the framework come on a rivetted joint in the side sheets.

Note.—In some gasholders the sheets and plates forming the sides break joint—as shown in the accompanying illustration—with a view to increased strength. This, however, is quite unnecessary, as the strain on the side sheets due to the pressure



of gas in a gasholder, supported by guide-framing the full height, is very little indeed. They are made thicker than theoretically required to resist the strains, for the sake of *durability*. The plan of "breaking joint" is much more troublesome in the erection; and unless great care is exercised, the sides are liable to have a wavy and buckled appearance.

(5) The drawing not only gives the centre to centre of all the joints with the ordered sizes of same, but also a table of rivetting—most useful in the construction and erection of the holder. Opposite every joint (vertical as well as horizontal) is the size, length, pitch, and position of rivets; and where there is more than one length of rivet in the same circle, the same arrow line followed on in the table gives their lengths and positions. The great use of this table is obvious; for a workman, by reference to the drawing, can tell at once the length of rivet intended for any particular place. How frequently it happens, where no such precaution is taken, that the wrong rivets are put in the wrong place; the result being that a lot have to be sent to replace those which have been used in the wrong positions, because they were intended for another part. Beside the inconvenience caused in carrying out the work, it involves the return of a great many rivets at the end of the job. Considerable time is saved by the use of a table like this, especially where several tons of rivets are to be dealt with.

(6) The positions of joints in top and bottom curbs, cup and dip channels, bead iron, cup and dip plates, &c., are likewise indicated on the drawing. They are arranged not only to "break joint" with one another, but also to clear one another; and thus simplify the rivetting. As before stated, the joint covers in every bay are in exactly similar positions throughout, and are equal in section to the parts joined.

(7) The diameters of the various lifts of the gasholder are arranged to suit the circumferences; the circumferences having been arranged to suit the number of bays, the length of each being equal, and determined by the pitches in the rivetting, &c.

(8) The thicknesses of the plates and sheets forming the sides are indicated clearly on the drawing. It is, therefore, unnecessary to repeat them here.

It should be noted that all bars which butt against one another have the ends faced in a machine. This is to secure exact lengths, and good solid bearing all across the section, which is particularly necessary in the case of compression members such as the angle-irons forming the top curb.

GAS ENGINEERS' POCKET BOOK AND LAMP-LIGHTING TABLES AND CHARTS.

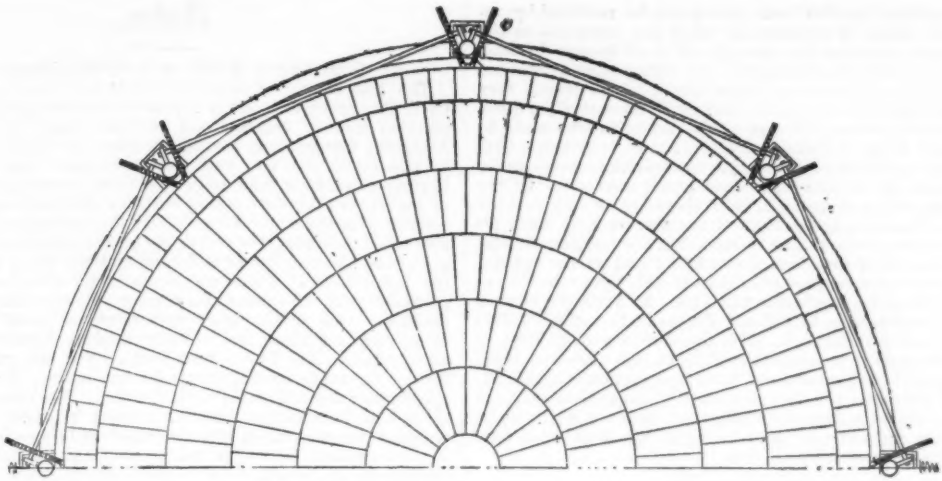
Gas managers, like many other orders of the community, have sundry enterprising caterers for their wants, who proffer various aids to the transaction of their business. The time has not yet come for a gas manager, or any other working member of the community, to transact all his affairs by automatic machines, set in action by the pulling of a string or the pressing of a button; but there are many ways in which labour may be economized. We recently showed how an enterprising maker of fireclay goods has essayed to save his customers trouble in the matter of giving orders for retorts and bricks; and now we find occasion for drawing attention in the same way to the useful annual publication known as Sugg's "Gas Engineers' Pocket Almanack and Lighting Table." This exceedingly useful and handy little book is issued by William Sugg and Co., Limited; and it is certainly a work that no gas manager should be without. The chief feature of the publication is a table, worked out to every day of the year, for the commencement of lighting and extinguishing public lamps, calculated upon both the common bases of 4300 and 3940 hours of lighting per annum. Interleaved with this are tables for the daily entering up of the carbonizing and gas accounts; the former being ruled for working out the yield of gas at per pound of coal. We wonder how many of Messrs. Sugg and Co.'s British customers adopt this datum. A glossary of technical terms in English, French, and German is useful; but in at least one instance it incidentally shows how necessary it is to know what is intended by the various equivalents of the words. Thus, "chimney" in English is rightly "cheminée" in French; but "lampenglas," given as the German equivalent, is only applicable when lamp chimneys are meant. Chimneys in connection with fire-places are distinguished as "schornstein" in German. Then, although "gasuhr" is the old-fashioned German word for gas-meter, these articles are now commonly called "gasmesser" in the German trade. Also, although wrought iron may be called strictly "fer battu" in French, it never is; but when the word "fer" is used the wrought variety of the metal is always understood—the single word "fonte" being employed to denote cast iron. This is, in point of fact, one of the few matters in which French is more concise than English, being capable of expressing by one word something for which we are compelled to use two. The book contains, besides a variety of data likely to be required by gas managers, and the usual space for diary and memoranda, a compendious list of the gas-testing and other scientific apparatus manufactured by the firm.

Herr Friedrich Lux, of Ludwigshafen and London, has also issued his lighting chart for the year. It is well printed, and shows at a glance all that it is necessary to know in connection with the hours of public lighting.

SPUR-WHEEL GUIDING FOR GASHOLDERS.

The interest which has been aroused in the question of the possibility of dispensing with the upper guide-framing of gasholders has brought out several suggestions of methods for dealing with the problem; but the device illustrated herewith, which is the invention of Mr. Jas. B. Terrace, of Brechin, is as ingenious as any yet published. It is so simple as almost to explain itself at the first glance. The idea is to surround a holder with a tier of spur-wheels keyed upon spindles long enough to reach the distance at which guide columns are ordinarily placed round the tank. The spindles, of course, must be carried in journals, which may be borne upon brackets or cantilevers securely anchored in the tank wall. Racks to gear with the spur-wheels are attached to the holder; and the consequence of this disposition is that the holder cannot possibly rise or fall unequally. The longer the device is looked at, the more striking it appears. It is Mr. Terrace's idea to fix the line of gearing (say) 6 feet from the ground, which would require the racks to be carried (say) 6 ft. 6 in. above the top curb. But then they need not be taken down nearer than 5 ft. 6 in. from the bottom curb. By this plan everything would be fairly above ground and open to inspection. There is no doubt that gearing of this kind would keep a holder upright; and in at least one respect it is preferable to the spiral and zigzag guides of Mr. Gadd and Mr. Livesey, with both of which our readers have been made acquainted, seeing that the holder would always be floating and would never "bind" on the guides as it must do in these other arrangements. The extent to which the binding action of a holder on a spiral guide would interfere with its free travel, and affect the pressure-gauge, is a moot point; but in any case it appears that there cannot be much oscillation in a holder maintained vertical by Mr. Terrace's plan.

This invention has a rather curious history. It is to be observed that, unlike Mr. Gadd and Mr. Livesey, Mr. Terrace has not patented his device, for reasons which require to be explained. With a diffidence not common among inventors, Mr. Terrace consulted several people as to the merits of his idea. His first communication was to Messrs. C. and W. Walker, to whom he described the arrangement as originally designed for a holder with old-fashioned cast T-frames. This letter was dated Nov. 17. He next submitted his views to Mr. Livesey, in a letter dated Nov. 23, which is couched in almost identical terms with his letter to Messrs. Walker; but in which the alternative arrangement of racks on the tank and spur-wheels on the holder is named. Mr. Livesey replied on Nov. 26, stating that Mr. Terrace had accomplished what he, Mr. Livesey, had thought was impracticable. "I said a year ago," continued Mr. Livesey, "if the bottom rollers could be spur-wheels working in racks on the tank, and the spur-wheels all connected together, so that one could not rise or fall without all the others rising or falling to the same extent, a gasholder could be held rigidly level; but I did not see how it could be done, and your plan makes it clear. If guide-framing can be dispensed with at all, your plan appears likely to be just as effective to that end as Mr. Gadd's or mine; possibly yours may be the best of the three. At any rate, I would suggest that you should adopt means for securing to yourself at least the credit of the idea. You might for a single-lift holder fix your spur gearing on the tank, with racks on the sides of the holder, and so guide it without any guide-framing. My opinion, as expressed at the Southern District meeting, is that for lofty telescopic holders it would be madness to erect them without framing; but whether it would be so or not, your idea is very ingenious and would certainly keep a holder level. I am much interested in your communication; and shall be glad to hear if



JAMES B. TERRACE'S SPUR-WHEEL GUIDING FOR GASHOLDERS.

(*For Description, see Opposite Page.*)

you do anything further. I have not mentioned it to anyone." This encouragement seems to have failed to remove Mr. Terrace's diffidence; and he accordingly wrote again to Mr. Livesey on the subject, and received a reply dated Dec. 3, in which he was again strongly advised to provisionally protect the invention, which Mr. Livesey characterized as "most simple and effective."

Not satisfied with these expressions of opinion, Mr. Terrace thought he would like to mention the subject of his invention to Mr. Gadd; but what follows should be told in his own words: "I felt strongly inclined to write to Mr. Gadd, Manchester, about my invention. Accordingly I wrote him on the 7th of December, asking him if he would have any objection to having a look at my invention; and he answered me on the 11th, that he would have no objection to see it. At the same time he told me that he had taken out another patent on the same subject as his first one. I sent him a copy of my invention on the 12th; then on the 13th he sent me word that his patent was identical to mine." It afterwards transpired that Mr. Gadd's second application for protection was dated Dec. 12; so that he was in error in informing Mr. Terrace on the 11th that the application had been lodged. The day's delay is, however, explained by Mr. Gadd in subsequent correspondence with Mr. Terrace. Here the matter rests as between Mr. Gadd and Mr. Terrace. The latter would not make an application for protection for something which Mr. Gadd informed him had been patented by himself the day before he, Mr. Gadd, received Mr. Terrace's description of his invention; and consequently he loses his chance of a patent through over-deliberation and taking advice of too many people. It is evident that the adage about the safety of numerous councillors does not hold good for patent business. All that is left to Mr. Terrace is to publish his ideas through the JOURNAL, in order that he may not lose his priority as well as his patent.

THE WORK OF THE PATENT OFFICE DURING 1888.—The total number of applications for patents was larger in the year just completed than ever before; being 19,070, as compared with 18,051 in 1887, or more than three times as numerous as in any year before the passing of the Patent Act in 1883. That this upward tendency indicates, says *The Times*, a real amount of industrial progress, it would be impossible to deny, though there is, combined with the rise in numbers, a slight fall in the average value of the inventions, as indicated by the smaller proportion which pass beyond the earliest stage. Very little more than half the applications become completed patents; and the percentage has been gradually, though slowly, declining as the total numbers have increased. Judging from the experience of the previous law, not a quarter of these completed patents will outlast the first period of four years. Under the old system, about 30 per cent. were not completed; and of those that were completed, about 70 per cent. dropped at the end of the first stage—then three years. The financial position of the Patent Office is thoroughly satisfactory; and it still continues to provide an important source of revenue. In 1886, it earned more than £40,000; and there is no doubt that when the accounts for the year just completed come to be made up, they will show a still larger surplus, since the renewal fees at the end of the first four-year period of the first patents taken out under the 1883 Act are now coming in. The expenses of the office are very great; the two main items of expenditure being salaries £47,000, and printing £24,000. There seems, therefore, no reason why the Patent Office should not soon be earning the income of £150,000 a year it was making before the heavy reduction of fees introduced by the 1883 Act; and under these circumstances it is not to be wondered at if urgent appeals are being made that the Treasury should consent to the reduction of the still heavy fees charged for the later stages of patents.

THE RELATION OF WATER SUPPLY AND DISEASE.

IN the course of the decade which ended with the year 1888, much was accomplished towards an intelligent development of national water supply. But when we recall the stirring of "Dry bones" which took place at the commencement of that period, it must be confessed that progress has not been so rapid or so completely satisfactory as it would have been reasonable to anticipate. It will be remembered that in the month of January, 1878, H.R.H. the Prince of Wales addressed an important letter to the Council of the Society of Arts, in which, having laid stress upon the deep interest which at that time the question of pure water supply was exciting throughout the country, His Royal Highness urged that great public good would in all probability arise from an open discussion of the subject under the auspices of the Society. With commendable readiness, the Council of the Society formed a Committee for the purpose of giving effect to so timely a recommendation. This Committee did a great deal of very useful work—not the least feature of which consisted in the compilation of a summary, setting forth the result of previous inquiries and proposals respecting the water supply of the country. The retrospect, for which the materials were most industriously gathered, was found to be of the greatest value in connection with the Congress held in May, 1878; and as a record of the association of water and disease in particular, the publication undoubtedly possesses permanent importance.

In the summary that was published by the Society in the same year—1878—will be found recorded the gist of the work done by the various Royal Commissions which have from time to time devoted attention to the question of water supply. The subject dealt with by the Royal Commission of 1865 possesses, for modern purposes, especial interest. The Commissioners of that year were to inquire primarily how far the existing use of rivers for the purpose of carrying off the sewage of towns and the refuse arising from industrial manufacturers could be prevented "without risk to the public health, or serious injuries to such processes and manufactures." Three reports were issued by Sir Robert Rawlinson and his colleagues on the Commission; and, although it would be impossible to deal here with the recommendations then made, the report might with advantage be consulted by those who wish to master the all-important subject of river-pollution and its consequences.

But the Commission of 1865 by no means exhausted the subject; and, in recognition of that fact, another Royal Commission, having in the main the same object, was appointed in the year 1868. In this instance the Commissioners issued no less than six reports, the last of which showed how careful and laborious an investigation had been carried out. Sir William Dennison and his coadjutors were the first Royal Commissioners who inspected the works of the eight Water Companies, whose mains, even at that period, daily distributed 100 million gallons of water to the inhabitants of London. Not only did the Commissioners inspect the Companies' works, they obtained, and caused to be analyzed, numerous samples of water taken from the reservoirs and the distributing mains, as also from various points within the basin of the Thames. The results are set forth in the report, and may be studied with advantage even after the lapse of twenty years. History is only too apt to repeat itself; and records such as those preserved or indexed by the Society of Arts convey lessons which it would be madness to disregard. Nobody would be so foolish as to question the connection existing between drinking-water and health; and yet, as we have of late taken occasion more than once to point out, the foundations of wholesale injury are even now being laid by certain of the towns which border the Thames, while the Conservancy Board stand helplessly looking on. We write in the interests of the

present generation, but the best service can be rendered by reminding those whom it concerns of what has happened in the past. In regard to many diseases, the effect of impure drinking water still demands further research; but with respect to cholera, there has been a completeness of examination which leaves very little to be said, though it demands that much more shall be done. The reasons for the thoroughness of the investigations made in this particular field of disease are, of course, obvious. The ravages caused by this especially terrible form of sickness necessarily served in times past to arrest and rivet public attention. Of the great mortality which occurred in 1832, there are no very reliable data; the explanation being that there was at that time no official registration of the causes of death, but the number of fatal cases reported to the Privy Council was 5275; and as the population of London then amounted to only 1,681,641, the proportion of deaths to 10,000 of the population was 31·4. In 1849, the victims of cholera in London were 14,137, out of a population of 2,286,800; or 61·8 out of every 10,000. In 1854, the deaths were 10,738; or 42·9 per 10,000, out of a population of 2,504,198. And, in 1866, 5596; or 18·4 per 10,000, out of an estimated population of 3,037,991. Between the first and the last named of these epidemics, great changes were effected in the system of London water supply. Upon the significance and value of those changes, we shall avail ourselves of another opportunity to speak.

The Institution of Electrical Engineers.—The Society of Telegraph Engineers and Electricians (founded in 1871, and incorporated in 1883) has now become the Institution of Electrical Engineers. The opening meeting of the session will be held on Thursday next, the 10th inst., when the President (Sir William Thompson) will deliver his inaugural address.

A Large Consignment of Petroleum from Batoum.—Yesterday week a special train, containing 500 barrels of petroleum, was dispatched from Barrow to Liverpool. The oil arrived by the steamer *Caucase* from Batoum on the previous Friday; the whole cargo of 2003 tons being pumped into the petroleum tanks in 24 hours. The London, Liverpool, and Barrow Kerosene Company, who have erected large storeage tanks at Barrow, have arranged for regular cargoes from Batoum.

The Debentures of the Metropolitan Gas Company of Melbourne.—Last week the Commercial Bank of Australia, Limited, invited tenders for a loan of £50,000, on behalf of the Metropolitan Gas Company of Melbourne, in 4½ per cent. debentures, redeemable on Oct. 1, 1918. The debentures were in sums of £100 each, with a minimum price of issue of £105, charged and secured upon the undertaking, rates, and other revenues of the Company, which include freehold properties stated to be of a value largely in excess of their debenture debt. Including the present issue, this amounts to £657,000. The authorized capital of the Company is £1,000,000, of which £657,210 has been issued and paid up in full. The tenders were due to be opened to-day (Tuesday).

Death of Mr. Alderman Moscrop, of Bolton.—On Saturday forenoon the remains of Mr. Alderman Moscrop, J.P., the ex-Mayor of Bolton, and who was for so many years Chairman of the Gas Committee of the Corporation, were interred in the family vault in St. Paul's Church, amid many manifestations of respect and esteem. Amongst the deputations attending the funeral was one from the Corporation Gas Department, consisting of Mr. Alderman Miles, J.P., Chairman of the Gas Committee; Mr. Broughton, Vice-Chairman; Mr. W. Smith, the Gas Engineer; and Mr. W. Walsh, the Office Superintendent. A handsome wreath was sent by the *employés* in the Gas Department, "As a tribute of sincere respect, in memory of our late Chairman." The deceased, who was in his 78th year, died on New Year's Day morning, after a prolonged illness. His connection with the Bolton Gas-Works, both under the old Company and as a corporate undertaking, has been of a most important character. He was a Director of the Company for many years, and served as Chairman for seven years prior to the transfer of the works to the Corporation, in 1872.] It was not until five years later that Mr. Moscrop entered the Council; being then elevated to the aldermanic bench; and at once unanimously appointed Chairman of the Gas Committee, which position he held down to November, 1887, when he was selected to the chief magistracy of the borough; his successor being Alderman Miles. During the eleven years he presided over the deliberations of the Gas Committee, most remarkable progress was made with the undertaking; and an enormous profit handed over in relief of rates. On his elevation to the mayoralty, Alderman Moscrop referred to the gas-works, in his inaugural address, with pardonable pride. He then pointed out that the sum of £565,815 had been expended on the works; and he ventured to say that, for efficiency and economy of working, the Bolton Gas-Works would compare favourably with any similar undertaking in the kingdom. As an evidence of this, he said that whilst the price charged for gas had been of a fair market value as compared with surrounding towns, during the fifteen years the gas-works had been in the hands of the Corporation a sum of not less than £113,690 had been transferred from the profits in aid of the rates, which sum, had the gas-works been a private undertaking, would have gone into the pockets of the shareholders as dividends. As showing the development of the undertaking, he then stated that, when the works were purchased by the Corporation, the yearly sale of gas was 304,250,000 cubic feet; and at the time he spoke, it was 567,000,000—an increase of 86 per cent.; while the average price per 1000 cubic feet had been reduced from 3s. 4½d. to 2s. 8½d., or 20 per cent.

Notes.

Compression Tests of Building Materials.

The last volume of Transactions of the American Society of Civil Engineers contains a report by a Committee upon compression tests of cements and mortars, made by means of the American Government testing-machine, at Watertown Arsenal. It was found that the best way to prepare such materials for bearing a crushing load is to face them accurately with plaster of Paris; so that the bearing surfaces shall take up the weight equally over the whole area. The cubes failed generally by splitting off at the sides; the remaining portions forming two truncated pyramids, the smaller ends facing, and the bases formed by the two bed surfaces. There was occasionally a tendency to develop pyramids with the apexes overlapping. Prisms failed in a similar manner. One of the most important series of tests in the Watertown record is that of 33 brick piers of various dimensions and lengths. The bricks were laid on the bed, with the joints broken in every course, except in two cases. The ages of the specimens ranged from 14 to 24 months. The loads were applied in regular increments; the compression at each imposition of weight being measured, and the machine being allowed to return to zero occasionally, to determine the set. Cracks made their appearance at the surfaces of the piers, and were gradually enlarged before the maximum loads were reached. Final failure was caused by the partial crushing of some bricks, and some enlargement of the cracks. These took a longitudinal direction, and occurred in the bricks of one course opposite the end joints of adjacent courses. Snapping sounds were heard long before cracks appeared—in one case at 200 lbs.; in another at 300 lbs.; in about three instances, at 400 lbs.; and in four, at 500 lbs. per square inch. Piers built in Portland cement exhibited the highest resistances; thus indicating that the quality of the mortar has much to do with the strength of brickwork. The experiments seem to show that, when lime mortar is used, the yielding is mainly at the joints. Piers in lime mortar with joints broken at every sixth course appeared to be stronger than those with joints broken at every course; but more experiments are required to substantiate this conclusion. Hollow piers are for the same mortar about as strong as solid, per square inch of solid section. The report concludes with a repetition of the conclusion that the mortar or cement has more to do with the strength of piers than the bricks of which they are built.

Electric Welding.

Mr. C. J. H. Woodbury, of Boston, U.S.A., has read a paper on electric welding before the American Society of Mechancial Engineers. After explaining the principles of the process, the author went on to describe how the two pieces to be joined are secured in firm end contact by adjustable copper clamps, which conduct an electric current of large volume through the joint. The resistance at the break causes a development of heat at this point, which increases until the two metallic ends fuse together. The weld begins at the centre, and proceeds radially to the outside. The enormous electric currents used in the process sometimes reach 50,000 ampères; but as the electro-motive force is only half a volt, they are incapable of giving any sensation to a person. The operation of electric welding is one of the simplest of mechanical processes; requiring but little skill on the part of the operator in comparison with the exact training of hands and eyes and long experience necessary for ordinary welding on the anvil. The heat is at all times completely under control by means of a lever; the dynamo which generates the electricity is self-regulating, and requires no attention except for lubrication. There is no unnecessary waste of fuel; the heating being so local that cotton-covered wire ¼ inch in diameter can be welded without the singeing of the covering for a distance of more than ¾ inch from the weld. Tests of electrically welded metal made at the Watertown Arsenal, including wrought iron, steel and iron, copper, brass, brass and wrought iron, steel and German silver, were given as an appendix to Mr. Woodbury's paper; showing that the welds were, as a rule, quite as strong as the rest of the samples.

Tests of Naphtha Gas.

The great extension of the use of naphtha gas in Russia, and the lack of any practical data respecting the illuminating power and explosive force of mixtures of this gas with air have induced MM. Jawein and Lamansky to undertake a series of experiments with this product. The results were published in the *Revue Industrielle des Mines et de la Metallurgie*. In order to preserve their experiments from the notable variations of the composition of gas taken at different times from the same works, every successive series was carried on without interruption for a whole day. The apparatus employed consisted of a small gasholder containing about 2 cubic feet, into which a determinable quantity of gas was introduced through a meter connected with a supply-pipe; and another meter and supply-pipe in connection with a second holder was used for introducing the required quantity of air. Every time a mixture was made, its specific gravity was determined, and its illuminating power was tested as burnt in an Argand burner compared with a standard candle flame 45 mm. high. The specific gravity of the pure naphtha gas was 0·685; and, consumed at the rate of 3·3 cubic feet per hour, it gave an illuminating power of 31 candles. Admixture of 5 per cent. of air raised the specific gravity to 0·719, and reduced the luminous value to 25 candles

for the same consumption. With 10 per cent. of air the specific gravity was 0·732, and the illuminating power 21 candles. With 20 per cent. of air the specific gravity of air went up to 0·755, and the illuminating power fell to 15 candles, with a consumption of 3·4 cubic feet per hour. Finally, the addition of 50 per cent. of air increased the specific gravity to 0·796, and brought down the illuminating power of 3·5 cubic feet to 5·5 candles. Thus, in round numbers, 10 per cent. of air lowered the illuminating power by one-third; and 20 per cent. of air brought it down to one-half that of the pure gas. By increasing the pressure at the point of ignition, the illuminating power of a mixture of naphtha gas and air may be improved; but at a correspondingly increased expense. Under a pressure of 16 inches, naphtha gas, mixed with 50 per cent. of air, will give an illuminating power of 23 candles for a consumption of 5·7 cubic feet per hour. MM. Jawein and Lamansky determined the explosive power of different mixtures of naphtha gas and air by igniting them in a eudiometer tube. They found that for volumes up to 5·2 of air to 1 of gas, there was no explosion. A feeble explosion began at 5·6 to 5·8 of air to 1 of gas. It was strong with 6·0 to 6·5 of air; very strong at 7·0 to 9·0; strong at 10·0 to 13·0; feeble again at 14·0 to 16·6; very weak at 17·0 to 17·7; and nothing beyond 18. It follows, therefore, that an explosive mixture of naphtha gas with air must not contain less than 85 per cent. or more than 94·4 per cent. of air. These volumes are not absolute, as they are affected by variations of the composition of the gas.

Communicated Article.

THE CHEMISTRY OF ILLUMINATING GAS.

By Norton H. Humphrys, Assoc. M. Inst. C.E., F.C.S.

II.

In looking for an answer to the question, "What is a gas?" it is impossible to avoid the conclusion that the position of that form of matter which is usually distinguished by the term "gas" in relation to other forms, is as yet but dimly and imperfectly understood. It is barely a century since the existence of gases as a distinct form of matter was admitted; and only half that period since scientists have been in a position to prepare the various kinds of gases, and study their properties with any show of accuracy. The progress that has lately been made, however, affords promise for the future; and many young beginners who read these words will live to see a great advancement in this respect. At present a popular definition of a gas would be that it is "the lightest form of matter," or that the force of repulsion existing amongst its atoms, is stronger than that of cohesion. But there are indistinct foreshadowings to be perceived in recent investigations, which indicate the possibility of the existence of matter in forms more dense and heavy than that of solids, or more light and ethereal than that of gases. It is well known that, even in the densest solids, the molecules are not in absolute contact—that there is a space, unmeasurable and infinitesimal to our notions, but still a space, between each; and therefore it is possible to imagine the existence of a form of matter in which the atoms are in absolute contact. On the other hand, the remarkable degree of attenuation to which gases can be reduced by high temperatures or low pressures, leaves it open to supposition that a degree of expansion may be reached when different molecular conditions obtain.

Whatever the advancement of science in the future may lead to, however, is rather outside the scope of the present papers, which aim at taking illuminating gas just in the lights by which we know and understand it at the present time. Thanks to the labours of a large number of investigators, we are now in possession of a tolerably complete knowledge as to the properties of gases. As a class they are more distinct in several respects than other known forms of matter. All permanent gases are equally affected by the conditions of temperature and pressure; and they combine together in simple numerical relations by volume. When exposed to contact with liquids, two results may follow. A large proportion of the gas may be absorbed by the liquid, and a part of the liquid may be vaporized and mixed with the gas. This property also applies to some solids, but in a very limited degree. In all cases, however, these reactions are not matters of hazard; they follow the regular laws. We have also to do, principally, with gases that are combustible that are capable of combining with oxygen, the result being the production of light and heat, and a complete change in a chemical sense. Here again the same preservation of order obtains. A given quantity of gas combines with a known quantity of oxygen. The heat produced, and in many cases the light also, is fixed and definite, and the products of combustion are equally rigid in their character.

Here we pause for a moment to consider the relation between gases, liquids, and solids. There is good reason to suppose that the form in which a substance exists is dependent not so much upon the nature or kind, as upon the external conditions of temperature and pressure. The existence of metals, which to us are known as solids, has been proved to obtain in the sun in the form of gases. Some of our modern scientists have been able to obtain bodies in the form of solids or liquids which had hitherto been supposed to exist only as permanent gases. For example, ethylene or olefiant gas, known as a constituent of coal gas, becomes a liquid if reduced to about 290° Fahr. below freezing point; and by the application of a still higher degree of cold, it has been obtained as a solid. Carbonic oxide and acid have both been liquified, and, in the latter case, solidified. Both the gases which constitute our atmosphere—nitrogen and oxygen—have been reduced to the liquid state; forming colourless transparent liquids. Hydrogen has also been liquified; but the degree of temperature and pressure required for that purpose is very far removed from ordinary cosmic conditions. Oxygen liquifies at about the same degree of temperature as ethylene, if subjected to a pressure at the same time of about 400 lbs. per square inch; nitrogen under similar circumstances of temperature, requires a higher pressure; and hydrogen will not liquify under something like 3000 lbs. per square inch pressure. The difference between liquid hydrogen, oxygen, and nitrogen, as compared with liquids which boil at temperatures and pressures easily obtainable—such as water, alcohol, or carbon bisulphide—is merely one of degree. There is no reason why it should not be possible to convert all known gases—that is, bodies that are gaseous under ordinary conditions of temperature and pressure—into liquids or solids; or, on the other hand, to convert solids into liquids or gases; and generally to ring the changes upon each of these forms of matter simply by varying those conditions. So it is necessary to be careful to avoid the supposition that the three classes of matter—solids, liquids, gases—must necessarily represent different orders of matter.

Gases like hydrogen, oxygen, and nitrogen, which require the application of conditions far removed from those which obtain in our atmosphere to secure their liquification, are usually spoken of by the convenient but inaccurate terms of permanent gases; whilst others which are easily liquified are spoken of as "vapours."

It will be evident that the difference between vapours and permanent gases is only one of degree. In all cases the change from one form of matter to another is not definite or sharp. As the boiling point is approached, considerable quantities of vapour are liberated; and, indeed, it may almost be said that liquids evaporate at all temperatures below boiling point, provided they are exposed under suitable conditions to a gaseous medium. Perfectly dry air, even at freezing point, greedily absorbs water; the same being converted into gas, until a point called the saturation point is obtained, when no further quantity will be taken up. In a similar manner, there is not a clear line of demarcation between the hard solid, the mobile liquid, and the dry invisible gas. As heat is applied, the solid softens and melts gradually, a certain standard called the melting point being attained. If the liquid is exposed to heat, as the boiling point is approached, it begins (to use a popular expression) to steam. Even when the liquid boils the result is not a pure gas, but a certain amount of vapour is carried off also, which can only be got rid of by "superheating." Indeed some have been led to suppose the existence of a form of matter intermediate between liquid and gas, which may be represented by ordinary mist or fog, or cloud; the matter being in a vesicular condition, or composed of minute drops. The exact point at which the vesicular condition merges into that of gas, is an interesting question for scientists, but it will be sufficient in connection with the present subject, to remember that the change from liquid to gas is very gradual and indefinite.

One reason of the gradual change from one form of matter to another is the fact that a considerable quantity of heat is either liberated or absorbed. If this amount of heat can be supplied rapidly, an instantaneous change from solid to gas may take place; and the result is an explosion, attended with development of disruptive forces. In converting water into steam, for example, more than five times as much heat is absorbed, as is necessary to secure the mere raising of temperature. One gallon of water can be raised from 60° to 213° by the expenditure of $(213 - 60) \times 10 = 1530$ B. A. units of heat. Unless more heat than this be supplied, the production of steam is merely trifling; and if the whole is to be gasified, we must apply at least an additional 9650 units, making 11,800 units in all. This is the only instance in which the latent heat of gasification has been repeatedly and carefully investigated; but we may learn from it a useful lesson in regard to the retort-house. The retorts must be continuously supplied with heat. Many engineers speak as if the introduction of cold coal, or possible loss of heat by the accidental admission of cold air in the course of drawing or charging, was the only source of loss to which the retorts are subjected. The latent heat of gasification—so called because the heat is rendered latent or hidden—is a far more active and potent source of loss of heat than any of these.

Another reason for the gradual change, is the great extent of expansion that takes place during the act of gasification. One gallon of water occupying a cubic content of 0·16 cubic foot, furnishes more than 300 cubic feet of steam, an expansion of nearly 2000 times. A gallon of light petroleum, occupying a similar bulk, will yield 120 to 130 cubic feet of gas, exclusive of residue, representing an expansion of 700 or 800 times. A ton of coal, occupying, perhaps, 40 cubic feet, will yield 10,000 cubic feet of gas, apart from one-tenth of its bulk in liquids, and a large solid residue, representing an expansion of nearly 300 times. When we consider the enormous extent of force that would be necessary to reduce hydrogen and other so-called permanent forces back again to the bulk or volume represented by them during their existence in coal or oil, it is evident that, by the application of heat—proceeding in a direction opposite to that necessary to secure the liquifaction of gases—enormous molecular forces are, so to speak, unlocked, in addition to that required by the new form of matter in order to make room for itself. The 10,000 cubic feet of gas produced under ordinary circumstances, for example, has to do

the work of displacing a similar bulk of air under the existing circumstances of pressure.

The majority of gases are colourless, although some—such as chlorine, and some of the oxides of nitrogen—present very marked colours to the sense of sight; so that we should be ignorant of their existence but for their very intimate effect upon animal life. Those who have seen the influence of a poisonous gas, exemplified by a strong healthy man descending into a brewer's vat or old well, where there is an accumulation of carbonic acid gas, and being in an instant rendered lifeless without any apparent cause, can well pardon the superstitution of ignorant persons, which would attribute such a remarkable result to supernatural agency. So frail is our human nature, that the air which we breathe must contain not less than 20 and not more than 22 per cent. of oxygen, and must be free from poisonous gases, or at least such must not be present in greater proportion than a few one-hundredth parts per cent., if health is to be preserved. This is a point which anyone concerned, either practically or experimentally, in the production of various kinds of gases in quantity, will do well to lay to heart. The retort-house, purifier-house, and laboratory must all be thoroughly well ventilated. This is usually well attended to in gas-works; but still its importance warrants its repetition, especially in regard to those who may contemplate following out, experimentally, the various investigations and tests that will presently be considered.

Only one other point of a general nature remains to be noticed, and that is the standards to be used in this series of papers, respecting which a clear understanding at the outset is desirable. At the present time the writer of a work that aims at being practical, and at the same time not unscientific, is placed in somewhat of a dilemma. In all modern scientific works the metric system is adopted, and very rightly so, as in a general scientific sense it is far more preferable than our British standards, and it brings with it, incidentally, the use of the Centrigrade thermometer scale, and of special units of force and electricity. But in nearly all the literature of our subject, the British standards are used. In addition, they are adopted for our commercial standards, such as the ton, the cubic foot, and the gallon. For these reasons it appears to be desirable that they should be retained in the present work. They are so generally known, or so readily ascertained, that a detailed recapitulation of them is not necessary; but it may be mentioned that they include the Fahrenheit thermometer scale, the British Association unit of heat (which is the quantity of heat required to raise 1 lb. of water from 60° to 61° Fahr.), and the horse power as a unit of mechanical force—33,000 lbs. avoirdupois lifted one foot high in one minute.

THE POWERS OF WATER COMPANIES.—Having considered the power of Water Companies to cut off water from houses which are under the constant-supply system if the fittings are in such a state as to occasion waste of water, the Clerkenwell Vestry deemed it advisable, in the interests of the public health, that the Companies should be deprived of this power. After communicating with the other Local Authorities of the Metropolis, the Vestry requested Captain Penton, M.P., to introduce a Bill into Parliament empowering the Companies or the Local Authorities to carry out the necessary works in cases of waste, and to recover the costs from the owners. The member for Central Finsbury has consented to bring forward a Bill with this object next session. The New River Company have written to the Vestry suggesting that the latter should move the Local Government Board to initiate a constant supply in the remaining portion of the parish.

THE LECTURES ON COOKING BY GAS IN BRUSSELS.—In further reference to the series of lectures by Madame Alting-Mees which we recently noticed in the JOURNAL, a correspondent informs us that on Wednesday, the 26th ult., Madame Alting-Mees demonstrated the utility of gas as a cooking agent before a large audience of French and Belgian engineers. The lecturer explicitly described the construction and uses of the various stoves and appliances employed in cooking by means of gas; and afterwards gave a sketch of the history of the use of gas in culinary operations in England and Paris, pointing specially to the great success which had invariably followed the introduction of the system of hiring-out gas-stoves by gas companies and municipal authorities owning gas-works. Afterwards, Madame Alting-Mees prepared and cooked a variety of pretty dishes; and there seemed to be but one opinion among the audience—that her eloquence and culinary powers would carry conviction to the most ignorant minds.

THE GLASGOW GAS EXAMINERSHIP.—It is announced that the Magistrates' Committee of the Glasgow Corporation have appointed as the Gas Examiner for the city, in succession to the late Dr. Wallace, that gentleman's former partner, Mr. Robt. R. Tatlock, F.R.S. Edin., F.C.S., F.I.C., &c. The appointment is in the first instance made for a term of three years; and Mr. Tatlock commenced his official duties on New Year's Day. He will have to visit, either personally or by a competent deputy, all the three manufacturing stations owned by the Gas Trust. The salary is said to be fixed at £150 per annum. There were other two candidates for the appointment—Dr. Clark (also partner with Dr. Wallace) and Professor W. Dittmar, F.R.S.; but neither of them was formally proposed when it was found that six out of the nine Magistrates present at the meeting had voted for Mr. Tatlock. Dr. Wallace, who was the first occupant of the gas examinership, had held it for about 18 years; and for a long portion of that time he also had charge of the work of testing the meters in use.

Technical Record.

THE DINSMORE GAS MAKING PROCESS AT WIDNES.

Mr. Isaac Carr, the Engineer and Manager of the Widnes Local Board Gas-Works, has sent for publication an extract from his last monthly report on the working of the Dinsmore process of gas making, which has been in operation under his control for a period of five months, on a bed of six single retorts with one "duct" or secondary retort. Mr. Carr remarks that the results obtained have been very much interfered with by the severe frosts of last month. In consequence of there being too large a condenser and no means of regulation, the gas has, night after night, been measured at several degrees below freezing point; so that, but for this circumstance, the results both for quantity and quality would have been very much higher. As it was, however, the following are some results obtained from Arley Mine "nuts," from Nov. 29 to Dec. 30 inclusive:—

Coal carbonized	86 tons 17 cwt.
Gas made	1,081,000 cubic ft.
" " per ton of coal carbonized	12,446 "
Average illuminating power	21·27 candles.
Quantity of tar used (estimated)	783 gallons
" " per ton of coal carbonized	9 "

The permanency of the tar-gas made by this process is (Mr. Carr remarks) equal to that of ordinary gas.

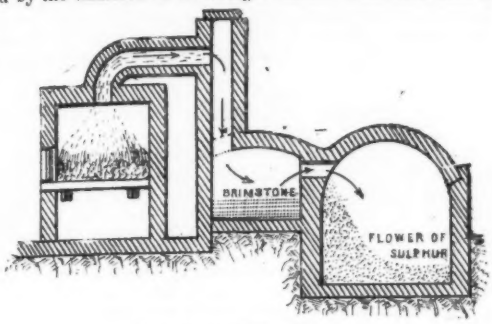
THE CLAUS SULPHUR KILN.

In the JOURNAL for April 17 last year, we referred, under the heading of "A Triumph of Modern Chemistry," to a paper, which was read before the Society of Chemical Industry, by Mr. Alexander M. Chance, F.C.S., describing a new departure for the recovery of sulphur from alkali waste by the aid of lime-kiln gases. From the last number of *Industries*, we learn that Mr. Chance's improvements have been in use for some time past at the works of the firm of which he is a partner at Oldbury, and that they are being adopted by other well-known alkali manufacturers in the country. Following this statement, our contemporary briefly describes the Claus sulphur kiln; and continues:

A short description of the Claus kiln, in which the sulphuretted hydrogen is burnt directly to sulphur and water, may not be uninteresting, as, in addition to the importance which the Claus patents have attained from the application of this method of sulphur recovery to the waste of alkali manufacturers, the experiments of the Ammonia Gas Purifying and Alkali Company in the same direction with the sulphur of coal gas at Birmingham, and more recently in Belfast, are such as to indicate that this process is one which is likely to prove economical to manufacturers of coal gas. Mr. Claus's first patent for obtaining sulphur from hydrogen sulphide dates from 1882; and in it is claimed the use of heated anhydrous oxide of iron for the absorption of sulphuretted hydrogen, and the admixture of cold or heated air in regulated quantities with the sulphuretted hydrogen before it is passed through the anhydrous oxide of iron, for the purpose of obtaining free sulphur in a continuous stream. The maintenance of the necessary temperature for causing the anhydrous oxide of iron to absorb the sulphuretted hydrogen, is insured by the admixture of the air with the gases; and the consequent carrying forward of the liberated sulphur. The process, as thus patented, is a continuous one for obtaining sulphur from sulphuretted hydrogen by means of anhydrous oxide of iron; and the conditions for success depend on the regulation of the quantity of air admitted to the kiln. The heat generated by the reaction itself maintains the oxide of iron at a dull red heat, and causes the sulphur to pass off in the free state, mixed with vapour of water, to the cooler parts of the kiln, where it is deposited, partly in the form of brimstone and partly in a finely-divided state, in the depositing chambers. Subsequently, further patents were taken out by Mr. Claus, to cover the use of various other oxides as substitutes for the oxide of iron used in the earlier work. It also appeared, from the investigations which were conducted at Oldbury, that many other contact substances effected this limited oxidation of the sulphuretted hydrogen; and patents were taken out to include the use of a bed or layer of fragments of any solid material—such as broken fire-brick, or other chemically inactive substance. In using these inert materials, it is, of course, necessary that the kiln should be in some cases maintained at a suitable temperature by the aid of extraneous heat; as the heat of the reaction may, when these other materials are employed, be not so limited in area, and thus prevent the rapid and continuous removal of the sulphur formed, as when oxide of iron is the material employed. The regular and constant adjustment of the amount of oxygen necessary to convert the hydrogen of the sulphuretted hydrogen into water, and at the same time to leave the sulphur unoxidized, was a matter which required a great amount of care and ingenuity, since by an excessive supply of air some sulphurous acid would be formed, and when the air was deficient in amount sulphuretted hydrogen passed through the furnace unconsumed.

The accompanying sketch shows the form of kiln in use at Messrs. Chance's works at Oldbury; and at Belfast, where the Ammonia Gas Purifying and Alkali Company are erecting for the Corporation a complete set of plant for the new gas-works, a similar form of kiln is being used. The Belfast Gas-Works will be the first to so employ this method of gas-purifying on a large scale, although the Claus kiln has been in use at several places in connection with the manufacture of sulphate of ammonia.

The process has been in use on a limited scale at the South Metropolitan Gas-Works in London, but has been attended from time to time with explosions, which have interfered with the working. At Windsor Street, in Birmingham, for some years, experimental plant was tried in connection with the gas-works of that town; and Mr. Watts, under whose direction the experiments were carried out, is now superintending the erection of the larger plant at Belfast. When used for sulphur recovery in connection with the purification of coal gas, ammonia liquor is employed to absorb the sulphuretted hydrogen present in the gas; and the liquor from the scrubbers, when sufficiently charged, is decomposed by the addition of a stronger alkali—soda and lime being



Sectional Elevation.

those which have been tried. At Belfast it is proposed to use lime; and two kilns have been erected, in order to allow of the process being a continuous one. Before entering the kiln, the gases evolved from the ammoniacal liquors are mixed with a quantity of air equal to about two-and-a-half times the volume of the sulphuretted hydrogen; and by means of taps, the supply can be regulated from time to time. To prevent the escape of unburnt sulphuretted hydrogen, a small tower, filled with pebbles, and supplied with water, is connected with the end of the depositing chambers; and, in addition, a small open oxide purifier is used, to prevent any traces of foul gas from passing into the air. With the lime purifiers in common use, considerable difficulty was experienced in Belfast, owing to the works being situated in the town; but it is hoped that, by the new process, any foul odours will be effectually prevented. The sulphur obtained is nearly 90 per cent. of the theoretical quantity, and is of pure quality, with the exception of a small percentage of carbonaceous matter deposited with the sulphur from naphthalene and other hydrocarbons which exist in the gases which pass through the Claus kiln. The marketable form in which the sulphate is recovered will form an important adjunct to the valuable waste products of the gas-works, and may cause the adoption of coals comparatively rich in sulphur by companies working the new process.

In using ammonia for the purification of coal gas, carbonic acid as well as sulphuretted hydrogen is removed; and by allowing a polysulphide to be present in the scrubbers, carbon bisulphide is also removed. A new bye-product—ammonium thiocyanate—is found in the spent ammoniacal liquors, and is formed from the ammonium cyanide produced from the small quantity of hydrocyanic gas existing in the foul gas, reacting with the ammonium polysulphide. The amount of thiocyanate formed is considerable, amounting to 2·3 lbs. of sodium thiocyanate per ton of coal carbonized. Various successful attempts have been made to utilize this new bye-product by converting it into cuprous thiocyanata (sub-sulphocyanide of copper) and sodium ferrocyanide. By the new process, the illuminating power of the gas is not diminished; and the possibility of any nuisance arising from the opening of the purifiers is obviated. We expect that after the completion of the works at Belfast, and a fair trial has been given to the new process, the economy of the new method of purification will be sufficiently demonstrated to insure its adoption by other gas-works.

The electric companies in Philadelphia are building a brick conduit, 8 feet high and 4 feet wide, in the main streets and avenues, in which to bury all their wires. In these will be fifty 3-inch pipes, each containing 100 wires. One connection will be made in each block, with a main from the conduit under the house line to the middle of the block, where a tall pole will distribute wires to the rear of the houses. Powerful pumps will keep the conduits full of dry air.

Among the New Year's Honours bestowed by Her Majesty was that of a Baronetcy on Sir Frederick Bramwell. This distinguished Civil Engineer is the youngest son of the late Mr. George Bramwell, banker, and was born in 1818. In 1856 he was elected an Associate of the Institution of Civil Engineers, and was President of that body in the year 1884-5; having at an earlier period been President of the Institution of Mechanical Engineers. He was elected a Fellow of the Royal Society in 1873; and in 1886 received the honorary degree of D.C.L. from Oxford University. Sir F. Bramwell was Chairman of the Executive Council of the Inventions Exhibition; and has for some time been Chairman of the City and Guilds of London Institute. The honour of Knighthood was conferred upon him eight years ago, for his services in the promotion of technical education.

THE DAILY EXPERIENCE AND OBSERVATIONS OF A GAS MANAGER.

By Jas. Somerville, of Indianapolis, U.S.A.

[A Paper read before the American Gaslight Association.*]

I am well aware I can find nothing that will be new to the majority of you; for my experience, from the nature of things, will be very similar to yours. Therefore, I shall only be telling you something you already know. But, no doubt, the Committee, in asking for such a paper, had in view the younger members of our Association, and that our experience might be of some value to them. I will, therefore, ask that class among us to accompany me on one of my daily walks through the works; and we will relate our experience and make observations as we proceed.

The first place we will visit is the retort-house, which is built on the stage principle; and, although the plan is more expensive to build and maintain, yet it has so many advantages that, in the end, I consider it to be the best and cheapest. No matter how small the works, I would advocate the adoption of this plan. One of its chief benefits is that you have ample space for the large modern gaseous furnace, which, in my opinion, is indispensable to the production of cheap gas; and if, as some of our sanguine friends predict, in a few years we will all be making fuel gas, then, with the two-storey retort-house, the change to the new order of things can be more easily and cheaply made. You will perceive that the settings are very open, only braced in front and rear, which I have found quite sufficient. This allows ample space and time for the proper combustion of the furnace gases. I should like just here to lay some stress on this element of time in all our operations. My daily observation is that time is an important consideration in the condensing and purification of the gas. Nothing is more injurious to the gas than to suddenly rush it into a lower temperature. It requires time to cool slowly; time to get rid of its tar; time to purify.

You will observe that the heats are good, but not high. I find there is no advantage in running high heats—that is, heats approaching a white. The gas from such heats is entirely denuded of its light naphthas, and is in a poor condition to stand any change of temperature, but deposits the crystals of naphthalene the first opportunity, which occurs generally before or in the purifiers. I judge of a good heat when the lid is taken off and the retort presents a bright red, sparkling appearance, without a trace of smoke. The coke is curled up at the sides, and comes easily out when the rake is applied to it. I have observed that when the heats are low from any cause, there is a corresponding decrease of ammonia; when the heats are good, the strength of the liquor increases. I am not prepared to say just why this should be; but the fact is well established in my mind that the higher the heats the greater is the production of ammonia. It is possible that the greater amount of nitrogen may be taken from the coke during high heats, and so cause the increase. Self-sealing retort-lids are only so in name. They do fairly well for the first year or so; but my experience is that beyond that period they are unable to stand the wear and tear of the retort-house. The parts begin to wear out; perfect contact cannot be obtained; their efficiency is ended; and we have to fall back to the old lute. I confess I have given the subject of self-sealing lids much thought; but the difficulties appear to be insurmountable. They must be able to stand all changes of extreme temperature. Their efficiency must not be impaired by the wear and tear of the parts; and they must be able to make a perfectly air-tight joint every time they are shut, notwithstanding that they have to be handled by men who believe only in the existence of muscle.

We now come to what I call the hot scrubber. It is so hot that you cannot keep your hand upon it. Here the gas takes a rest as it were, and gets rid of all its heavy tar. You can hear it trickling down between the plates; but the light tars or oily naphthas still flow on with the gas, which is gradually cooled. What tar is left is taken out by the Pélouze and Audouin condenser, which stands next to the ammoniacal liquor scrubber. I am aware that some object to placing the condenser at this point in the works; preferring to put it before the exhauster, where I have my hot scrubber. I think they are wrong; for it acts at that point too efficiently, if I may say so. It not only takes out the heavy tar, but the light naphthas also, and puts the gas in the same condition as if the naphthas had been burned up in the retort through extra high heats; and, moreover, the specific gravity of the tar at that point is so high that some will get through the condenser—not enough to help the gas any, but enough in the course of time to find its way to the liquor scrubber, to seriously impede its efficiency, and make it necessary to clean it out once or twice a year. This I never have to do; for no tar finds its way to the liquor scrubber nor into the liquor. This is important when making your own sulphate; for when tar gets into the scrubber, it seems in some way to neutralize the action of the water on the gas. I do not use fresh water in the scrubber. I have found it more effectual to use a mild liquor, of about 2 or 3 oz. strength. Gas has an aversion to cold water. It is like some gas managers I knew a long time ago—they preferred it mixed.

My experience with purifying material is that, when we used all oxide, it not only absorbed all the impurities, but a large proportion of the hydrocarbons also. I also attributed to its use an increase in the number of meters brought in for repairs. I had, therefore, to partially discontinue its use, and fall back on lime.

* An abstract of this paper, and the discussion to which it gave rise, was published in the Journal for Nov. 20, 1888, p. 892.

I find that the centre seal, to perform its work properly, requires to be thoroughly scraped and cleaned once a year. I prefer the open drip, because it can be kept clean, and easily supplied with fresh water. I do not think it is right to pass the purified gas over foul water in the seal.

My observation of the daily working of the holders leads me to this conclusion: Whenever trouble has occurred, it can invariably be traced to one source—viz., the weakness of the bottom curb. Let the bottom rollers get out of place, then the stability and safe working of the holder is destroyed. I have had a curious illustration of this fact. We have a holder 130 feet in diameter, and only 16 feet in height. Why it was built with these dimensions, I cannot tell. It is strongly trussed. The centre of gravity is nearer the top than the bottom; so that a little gale of wind invariably tipped it over. Indeed, I have seen it at right angles; one side jammed into the tank, the other high in the air. This occurred shortly after I took charge of the works. But the workmen were so used to it that it excited in them little surprise. But, as the cost of broken wheels and carriages was excessive, I resolved to see what could be done to make it work more steady. As soon as we got into it, I found, as you may anticipate, that every roller was out of place, and the bottom curb badly bent in. I substituted wrought iron for cast wherever it could be done with the rollers, and put a heavy log chain or brace against them on the inside, fastened to the curb, and jammed the rollers tight against the guides. I filled it up again; and no one was more surprised than myself to see how steady the holder has worked ever since, now nearly ten years ago. It has given no trouble, and is working every day. There are twelve columns to the holder; but, as for keeping it steady, it might as well be without them. So I think we may conclude from this instance that the safe working of the holders is dependent entirely on the strength of the bottom curb and rollers constantly tight against the guides.

In my daily photometrical tests I find very little variation. If the specific gravity increases without a corresponding increase in candle power, then it is time to examine the exhauster governor or the self-sealing lids. Much has been said and written lately against the candle as a standard of light. Its imperfections have been dwelt upon with great minuteness. But my experience is that, when the candle is burned under proper conditions, and due corrections made, for all practical purposes it does fairly test the illuminating power of the gas.

I have had some new experience in main-laying lately, which may be of some benefit to you should you be fortunate (?) enough to find a supply of natural gas near you. We had ten miles of 8 and 6 inch mains, which were laid by an opposition company, and which we did not need. We agreed to turn them over to a natural gas company for the distribution of their gas. The city ordinance required that they should be laid 3 feet under the surface, and that they should stand a pressure for one hour of 15 lbs. to the square inch. We had about 1100 services on these mains; 300 of them only in use. These had all to be cut off, and carefully plugged; for none of them were large enough for natural gas. For the purpose of testing, I cut the main into sections of about 2000 feet each, and exposed and set-up every joint. I then screwed a sensitive diaphragm spring-gauge into both ends, and (with a portable steam-boiler, having a Westinghouse air-pump attached to it) pumped the main full of air, until the gauges showed 17 or 18 lbs. to the square inch. Then the inspector appointed by the city, went over every joint with soap bubbles, and, with such a pressure on, the smallest leak was easily detected and made sound. If the gauges stood perfectly during the hour at that pressure, the section was accepted; if they showed the slightest drop, it was rejected. But I had very little trouble to get them to stand the test; indeed, many of the joints under the street car-tracks, which it was almost impossible to reach, I had to risk; and, without any setting up, they stood the test. It would happen sometimes during the test that the sun would be clouded, or a shower of rain would come on, which cooled the air in the pipe, and, of course, contracted it. The gauge would immediately show it, and the Inspector would reject the test. It was of no avail that I should try to instil into that functionary's mind, something of the science of pneumatics. His orders were that the gauge should stand. If it went up, as would sometimes happen, by the expansion of the air, he would make no objection. I observed during the progress of this work that where the mains had not been properly laid in lines, these were the joints that were the most liable to leak.

My experience is that every meter ought to be brought in, examined, repaired (if needful), and tested every five years. All our new meters are tested and stamped with date of test before sending them out. The result of our testing for one year was that all the new meters (419) were correct, 56 per cent. of the consumers' meters brought in for testing were correct, 25 per cent. slow, and 19 per cent. fast. The average percentage of error was 8·6 per cent. slow, and 7·3 per cent. fast.

"If you wish a thing well done, you must do it yourself," is an old remark, which applies with much force to the supply of gas for cooking and heating purposes. It was not until we took this business into our own hands that we had any success. We have now over 2000 stoves out, and giving great satisfaction; and, strange to say, even with the introduction of natural gas into our city, the sale of stoves has not ceased. I can only understand this from the fact that there is some uncertainty just how long the supply of natural gas will last, and our housekeepers desire to have at least two strings to their bow. I have observed that the main point in fitting up a gas-stove is to give it an abundant supply. The pipes should be large, and should come direct from the meter.

We have 600 consumers who pay weekly—most of them at their own desire. Of course this short reckoning entails some extra work; but our aim is, if possible, to meet the wishes of all our customers. I have found it beneficial to both Company and consumers to conduct our business as though we had constant, active opposition to contend with.

There are several matters connected with this subject to which I have not alluded. Such as what my daily experience would lead me to expect and receive from a ton of coal in gas, coke, tar, and sulphate of ammonia; also in the management of men and the maintenance of works. But I am sure the length of this, of necessity, rambling paper has already exhausted your patience.

WEST'S RETORT CHARGING AND DRAWING MACHINERY.

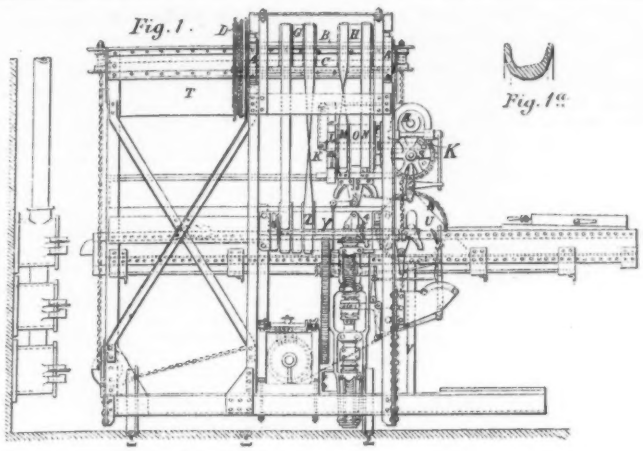
The Endless Wire-Rope System.

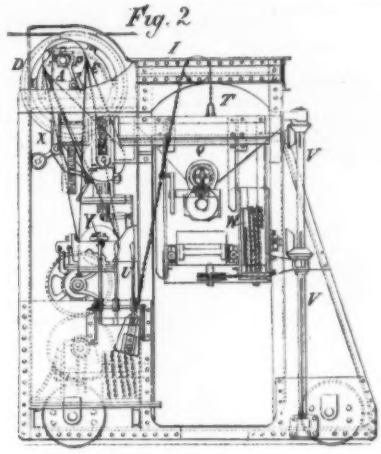
The latest development of the retort-house machinery designed and arranged by Mr. John West, of Miles Platting, Manchester, is that patented by him in January of last year, and of which full particulars are given in specification No. 723, issued the latter end of December. The general arrangement of frame and the working parts of the machine remain substantially as in patent No. 1226 of 1886; but, instead of using a steam boiler on each machine, and a steam and water cylinder with a rack and pinion working in connection therewith, Mr. West now proposes to actuate the working parts by means of a wire rope.

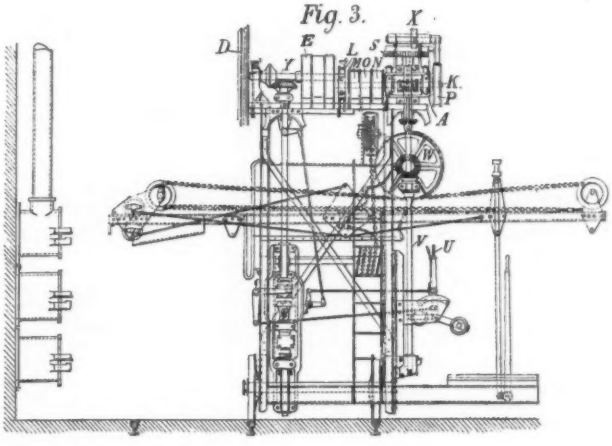
In the illustrations on next page, fig. 1 represents a side elevation of the machine for charging the retorts; and fig. 2 an end elevation of the same machine. Fig. 3 is a side elevation of the drawing machine; and fig. 4 an end elevation of it.

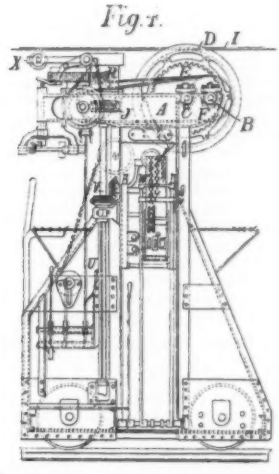
Upon one side of the charging-machine (figs. 1 and 2) are fixed to the angle-iron frame two brackets A, carrying two shaft bearings each. These brackets carry two shafts B and C, lying parallel to each other; one bracket with its two bearings supporting the shafts near one end, and the other bracket supporting them near the other. At one end of the shaft C, is fixed a rope pulley D, having a grooved rim of special construction, as shown in fig. 1a; and to the same pulley or shaft a spur-wheel E is fixed, having internal or external cogs or teeth. At one end of the shaft B is a spur-pinion F, which gears with the spur-wheel just described; and at suitable positions on this shaft, two broad belt pulleys G and H are keyed. The wire rope I is made to pass round the grooved pulley D, so that, when the rope is set in motion, the pulley and shaft C are revolved; and they drive the shaft B with the two broad pulleys G and H, through the agency of the toothed wheel and pinion E and F. The rope is in one endless length, and is stretched over pulleys fixed in the retort-house at any convenient position near each end of the retort-stack; and it is arranged so that it can be driven by belts or gearing, or by direct action from the motor. The rope therefore runs parallel with the face of the retort-stack; and at any requisite distance therefrom. The shaft K, to which the endless worm is keyed, is supported by brackets L, that hold it parallel to the shaft B carrying the two broad pulleys G and H; and upon the worm shaft K (between the bearings) are placed three pulleys M, N, and O—the two outer of which M and N run loose upon the shaft, while the third and middle one O is keyed to the shaft. To this same shaft there is also keyed, at any convenient position, a brake drum P, fitted either with a friction band or a block. The three pulleys M, N, and O on the shaft are arranged so as to permit of their being driven by belts from one of the broad pulleys H previously described; the broad pulley being about the same width as the sum of the widths of the three M, N, O, on the worm-shaft, or a little more than three times the widths of the driving-belts used. Over one of the loose pulleys H, a belt is passed, which also passes over the broad pulley N, and is laced or fastened as an "open belt;" while a cross belt is made to pass over the other loose pulley M, and over the same broad pulley H. Now, by properly arranged belt forks and handles, the worm shaft K can be caused to remain stationary while the belts are in motion, by keeping each belt on its own loose pulley—the two latter revolving in opposite directions; or the worm-shaft can be rotated in one direction by moving one belt off the loose pulley H on to the fast one O; or, again, the direction of revolution can be reversed by applying the other belt to the fast pulley O, after the first belt has been drawn back on its loose pulley. This can all be done while the broad pulley H is revolving constantly in one direction; and the whole combination of fast and loose pulleys, belt forks, and handles forms a belt-reversing motion. Upon the overhead shaft Q is also fixed a small pinion R, to drive a wheel S running loose on a pin, and having tappets for reversing and stopping the gear when necessary at each end of the stroke of the charger. The tappet-wheel S is also provided with a crown or projection, which goes partly round the circumference, for working the friction brake in a manner to be described in connection with the working of the charger into and out of the retort.

Suppose now that it is desired to make a stroke with the charger—the whole machine having previously been adjusted in position before a retort. The attendant first fills the charger-scoop with coal from the adjustable hopper T; and he then moves the hand-lever U connected to the belt forks, and causes one of the belts to move off the outer loose pulley on to the middle one O,









which is keyed on to the worm-shaft K. By these means the worm-shaft is made to rotate; and the worm drives the overhead shaft Q through the agency of the wheel J keyed to it. As the overhead shaft is geared to the vertical shaft V, and the latter to the chain drum W, exactly as described in the 1886 patent, any motion of the overhead shaft Q will cause a corresponding motion in the chain drum W; and the gearing can be so arranged that in one case, by depressing the hand-lever U, the charger will go into the retort, or it can be equally well arranged in another case that, by an opposite motion of the hand-lever, the same sequence of motion will follow. While the overhead shaft Q is revolving, it is also driving the tappet-wheel S by the small pinion R before described; and the ratio of the diameters of the pinion R and wheel S is such that the tappet-wheel S only makes a portion of a revolution, while the chain drum W is drawing the charger into the retort.

When the charger approaches the end of its forward stroke, one tappet of the wheel S comes into contact with a striking lever, connected by means of levers and rods with the belt forks. The tappet comes in contact with the long part of the striking lever, and moves it until the belt fork has shifted the belt back to the loose pulley; but the continued motion due to momentum of the revolving parts keeps the tappet-wheel S acting upon the striking lever until the latter has moved the other belt on to the fast pulley O. This reverses the action of the worm, and with it that of the chain drum W, so that the charger is stopped; the scoop turned over; and the charger is then drawn back to its former position ready for refilling.

The general arrangement of the drawing-machine remains substantially as described in patent No. 1226 of 1886, excepting that the boiler and steam and water cylinder are not required, but instead the parts are arranged exactly as for the charging-machine (see figs. 3 and 4).

The operation of drawing a retort is as follows:—Having adjusted the machine in front of the retort, and at the proper height for drawing it, the attendant moves the hand-lever U so as to cause the belt to drive the worm-shaft K in such a direction as to cause the wheel J to rotate the vertical shaft V. The drum W thus winds up the chain, and draws the rake-bar along the guide-frame and into the retort. The rake-head is kept above the coke while going into the retort, by means of a rocking-lever as described in the patent of 1886. As soon as the rake-bar has reached a point of its stroke near the extremity, the tappet on the tappet-wheel S comes into contact with the long part of the striking lever, exactly as described for the charging-machine. The rocking-lever is manipulated to depress the rake-head into the coke; and the reversal of the motion, by the action of the tappet-wheel, brings the rake-bar (and with it the coke) out of the retort.

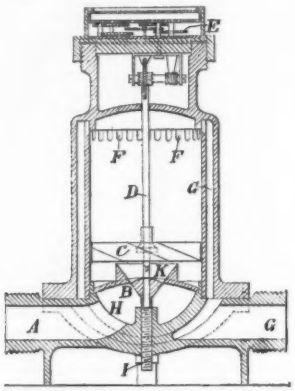
To prevent too violent contact between the crosshead of the rake-bar and the stops in the guide-frame at the end farthest from the retort, the same arrangement of brake and tappet gear is used as is needed for the charging-machine; and the action of it is precisely the same for both machines. It is frequently necessary and convenient to make short strokes with the rake-bar; and this is easily done by using the hand-lever of the belt reversing gear before the tappets come into action at either end of the stroke. But the manipulation of the belts between the ends of the stroke, by the hand-lever, does not upset the complete action of either of the tappets at the proper time for preventing any detrimental shocks between the rake-bar and the stops.

THE LATE MR. J. J. COLEMAN, OF GLASGOW.—The death is announced, as having recently taken place at Glasgow, of Mr. J. J. Coleman, a gentleman best known in scientific circles by his connection during the last few years with the Bell-Coleman dry-air mechanical refrigerator. When only 22 years of age, however, Mr. Coleman communicated two papers to the Chemistry Section of the Oxford meeting of the British Association—*i.e.*, in 1860—and about that time Dr. James Young, the father of the paraffin industry, brought out his invention of the manufacture of mineral oil. When a rich bituminous mineral, known as curly cannel, was discovered in Flintshire, and only a short distance from Chester, Mr. Coleman was tempted to erect and manage works for the manufacture of mineral oils. His reputation as a skilled chemist and general scientific expert induced the Directors of Young's Paraffin and Mineral Oil Company, Glasgow, to offer him the post of Manager of their works, which he accepted. In that capacity, he carried out experimental investigations for the utilization of so-called waste products; and he was able to show that the uncondensed gases produced in the distillation of the bituminous shale were capable of yielding, when subjected to great pressure and at a low temperature, highly volatile liquid hydrocarbons, having great solvent powers on various substances, and serviceable in producing illuminating gas where ordinary coal gas was not obtainable. In dealing with the uncondensed hydrocarbon gases from the shale retorts, he invented a machine developing the required low temperature and great mechanical compression; and it was this invention that introduced him to Sir William Thompson, and led to his being consulted by Mr. James Bell, the well-known shipowner and importer of fresh meat from the United States. Mr. Coleman, in order that he might devote his undivided attention to the solution of the great problem of mechanical refrigeration, then left the service of Young's Paraffin Company, and some ten years ago succeeded in solving it.

Register of Patents.

FLUID METERS.—Popp, V., of Paris. No. 15,878; Nov. 18, 1887. [8d.]

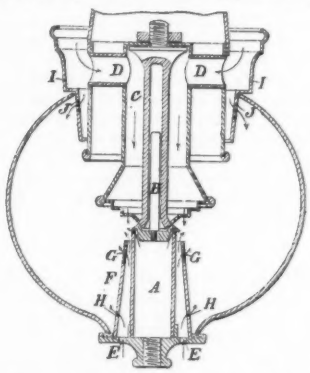
This invention relates to a fluid meter especially adapted to the measurement of the flow of a current of compressed air or other fluids—such as steam, gas, water, &c.—under variable pressure, and having variable speed of flow.



The meter comprises a cylinder, having a cover to which is secured suitable counting mechanism, and a wheel having blades fixed on a spindle that engages with the counting mechanism. A is the fluid inlet, and G the outlet. E is the counting mechanism, of any usual construction. H is a chamber in which the fluid enters, and which contains a regulating screw I, that also serves to guide the valve B. The fluid raises this valve more or less, according to its pressure, and escapes annularly between it and the cone or funnel K, to act upon the wheel C, which is formed with flat blades arranged at an inclination of about 25°. The shaft D of this wheel carries at its upper part an endless screw, which is the first member of the counting mechanism E. The measured fluid passes through the holes F into the double casing G^1, communicating with the outlet G.

REGENERATIVE LAMPS.—Thomas, T. C. J., of Hornsey. No. 16,247; Nov. 25, 1887. [8d.]

This invention has reference to regenerative or recuperative lamps of the general type described in patent No. 567 of 1854 (granted to William Young); and it has for its principal object to produce a lamp in which the air-heating apparatus is supported independently of the glass that surrounds or encloses the burner, and in such a manner as not to obstruct the light by rods, arms, or other supports outside the flame.



As shown by the illustration, the burner A is of the Argand type, but without a central air supply. It consists of a tube closed at its upper end by a cover, below which is formed a circular row of horizontal holes for the outlet of the gas. B is a rod secured to, and projecting upward from the cover; while C is an air-heating chamber provided with inlet passages D, secured at their outer ends to the chimney, the lower part of which surrounds the chamber C as shown. The central support of the lamp is formed with a socket to receive the rod B; and serving to maintain the air-heating apparatus in a vertical position. The lower part of the chamber C is preferably enlarged as shown; and to it is secured a perforated sheet metal plate or wire gauze, made in the stepped form shown, in order to provide a large outlet area for the passage of heated air, and to cause the streams of air passing through the openings in the plate or screen to cross each other, and thus become broken up. The air pressure is thus rendered approximately uniform upon the whole of the upper or inner surface of the flame; and the form of it is consequently maintained approximately constant.

In the gallery supporting the glass globe, openings E are formed for the entrance of air. This air passes into a chamber formed by a tube F surrounding the burner-tube A, and from which the air flows into the globe and to the outer side of the flame, partly through the upper end of the tube and partly through openings G formed in the upper part of the tube. H are openings for admitting a portion of the air to the lower part of the globe to keep it cool. I is a light cover arranged to surround the regenerator and also the lower part of the chimney, and to rest upon the glass bowl, the upper part of which it closes. This cover serves to direct air through the passages D to the regenerator, and is preferably formed with a depending portion provided with openings J for admitting a further supply of air to the globe to keep the upper portion of it cool and clear, and to assist in carrying off the products of combustion through the chimney.

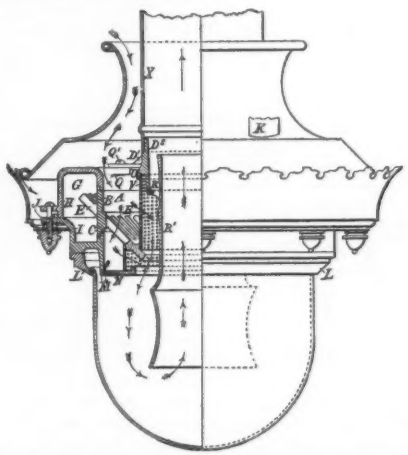
SUPPLYING GAS FROM EXISTING GASALIERS, BRACKETS, &c., FOR HANGING AND OTHER GAS LAMPS AND STOVES, AND FOR OTHER PURPOSES.—Beal, W., of Birmingham. No. 176; Jan. 5, 1888. [8d.]

This invention has for its object to provide a ready means of supplying gas from existing gasaliers, gas-brackets, and the like for burning and hanging lamps, table lamps, &c., and for heating and other useful purposes, without interfering with the burners of such existing appliances or removing the globes therefrom.

The arrangement consists in making the arms of the globe-holder tubular, in combination with a tubular boss carrying the primary burner, so as to supply gas through the arms for other purposes. It also consists in the combination with a globe holder having tubular arms, of a central tap or plug carrying the primary gas-burner, about which plug the globe-holder can turn, while the plug and the holder have passages so arranged that by turning the holder round the plug (into different positions) the flow of gas to the primary burner or through the arms can be regulated or stopped off.

GAS-LAMPS.—Gordon, T., of Victoria Street, Westminster. No. 911; Jan. 20, 1888. [11d.]

The object of this invention is to produce an improved construction of regenerative lamp, in which not only will the gas chamber be outside the burner, but, owing to the arrangement of parts, the burner and chamber may be readily constructed and also separated, and the parts removed for cleaning, renewal, or repairs. It is also projected to arrange the waste-product flue and chimney that it may be readily centred and yet be removable; while the supporting piece and air deflector may freely expand and contract without buckling.



The right side of the illustration is a vertical elevation of the lamp; and on the left of the centre line is a section illustrating the means adopted for securing the several parts in place.

The burner is cast of one piece of metal, having rim projections B and C above and below the centre line of the ribs E; the ribs being drilled through longitudinally so as to form passages for the gas. The spaces F between the tubes thus formed admit of the passage of air downward to the outer surface of the flame. The gas chamber G is formed in two sections H and I; having lugs J cast on their peripheries. These parts are fitted to each other, and to the burner, to form gas-tight joints; and one or more gas inlet ports K are connected thereto in such manner as to form supports in suspending the lamp. To the lower surface of the section I of the gas chamber is fitted the globe holder L. It also has cast upon its lower inner circumference, and projecting down therefrom, a rim M, to which is secured a deflector plate N. This plate is provided with lugs O projecting upward, having smooth holes drilled horizontally through them. It is of somewhat smaller diameter than the inner circumference of the rim M; thus leaving an annular space, through which air may pass to the inner surface of the globe, to prevent overheating. Any difference in expansion which may exist between the deflector N and other parts, is thus provided for. Section H of the gas chamber is provided with lugs Q at its upper surface, projecting inward; the object of them being to form a support for the spider D, which is constructed with ledges R upon its inner circumference. Projecting downward from the ledges are fingers, which also project inward and touch the centre flue some distance below its point of support. Above the ledges, and upon the inner circumstance of the collar D^2 of the spider D, are other projections which extend inward far enough to touch the outer circumference of the centre flue at some distance above the point of support; the object of this arrangement being to maintain the centre flue in a plumb and concentric position. An annular rim U, projecting downward, is also provided, the object of which is to secure the perforated cylinder V in place. The cylinders V and W serve the purpose of filtering the air supply, and causing it to be delivered to the flame evenly, and in smooth currents; preventing flickering and unsteadiness in the light. They also serve to more thoroughly heat the air. The arms D^1 of the spider are secured to the lugs Q on section H of the gas chamber G, by screws Q^1, so that while maintaining the spider in a position concentric with the other parts of the lamp, they are also free to expand and contract without injury to any part of the apparatus. The collar D^2, cast upon the spider D, has the chimney X attached to it.

GAS-BURNERS.—O'Reilley, G. J., of Highgate. No. 953; Jan. 21, 1888. [6d.]

This invention has for its main objects the regulating of the pressure of the gas at the orifice of the burner and the filtering of the gas as it is consumed. The patentee proposes to pack the space within the burner

with any loose fibrous material, such as cotton wool; and above and below the fibrous material is fitted a disc of fine gauze to confine the material within the burner. The patentee says he prefers to make the body of the burner in two parts, screwing into one another, to admit of the ready introduction of the material and the gauze discs. By this construction of burner the density of the packing can be regulated according to the pressure of gas in the mains; and thus give the best possible results in combustion.

STATION GAS GOVERNORS AND APPARATUS FOR VARYING THE PRESSURE OF GAS EITHER BY HAND OR AUTOMATICALLY.—Bartlett, J. K., of Battersea, Surrey. No. 14,342; Oct. 5, 1888. [8d.]

This invention has for its object to ensure more perfect regulation of pressure in the outlet mains of gas-works, while it allows of the adjustment of the valve to its seat, with the removal of any extraneous matter, and the admission or withdrawal of water from the float, so as to adjust the pressure, either by hand or automatically.

Fig. 1.

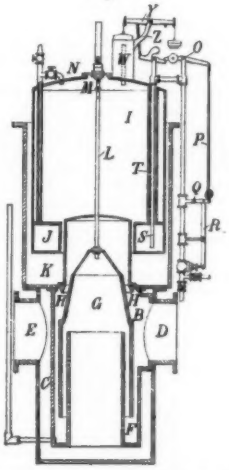


Fig. 1 is a vertical section of the governor, showing one arrangement for supplying and withdrawing water from the float. Fig. 2 represents the apparatus for automatically increasing or diminishing the pressure at stated times.

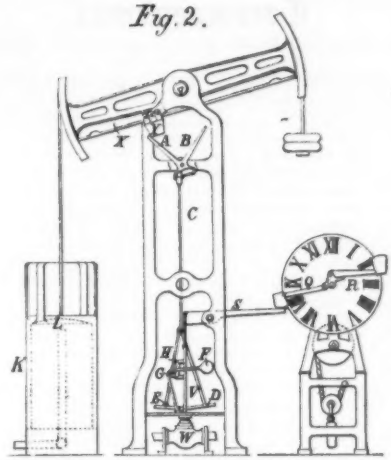
The governor consists of a casting having two chambers B and C, to which are connected the inlet pipe at D and outlet pipe at E. Within the chamber separating the inlet from the outlet, and which has a concentric tank F, rises and falls a long hollow valve G, open both top and bottom, and the upper part of which is somewhat conical. In the upper part of the inlet chamber, the valve seat H is placed; the valve being suspended from a bell or holder I, having an air float J, and capable of rising and falling within a tank K supplied with water in the usual way.

In order to remove any deposit that may form upon the valve or seat, the rod L by which the valve is suspended is jointed in two places at M, in opposite directions, so that the valve may the better adjust itself to its seat. The rod passes through a plate N in the crown of the bell and is screwed on that part within the bell. The part of the rod that projects through the crown is made square for a short distance, and is furnished with a sleeve and washer while the portion above the square is screwed and also has a nut and washer. The result is that, supposing any deposit should rest upon the cone G, the upper nut may be slacked so as to admit of the application of a wrench or spanner to the square part of the rod; whereupon the cone may be made to turn or partially turn against its seat, and by that means rub off the deposit, without stopping the action of the governor.

The improved apparatus for adjusting the pressure by hand consists of a small tank W, fixed to the top of the bell of the governor; and in this tank (supplied with water) there is, free to rise and fall, a very small bell X, the interior of which is in communication with the bell I by means of a stand pipe, dotted in the drawing. The bell is of such weight as to give the maximum pressure, and is suspended from a beam Y supported by a bracket Z, fixed to the side of the tank. To the opposite end of the beam, weights are attached; and beneath the beam there is a weighted lever, one end of which is hung to the beam by a cord fastened between the end supporting the bell and the fulcrum. The opposite end of the weighted lever acts as a sort of catch to a second weighted lever O which operates on a spring valve or tap below. When it is desired to increase the pressure, weights are removed from the beam Y; and when the pressure has attained the maximum to which the apparatus has been adjusted, the bell will ascend and release the catch and lever, whereupon the rod P will be raised, drawing with it the pivotted lever Q, thus releasing the end of the lever R, when the valve by the action of its spring will close and the water previously supplied through a syphon to the air float of the governor will cease, the short leg S of the syphon being introduced into a well T formed near one side of the principal holder, and the well being in communication with the float. The weight thus added to the gasholder has the effect of opening the valve and increasing the pressure. When the pressure is to be reduced, weights are added to the beam Y; and the cord from the catch is attached to that part of the beam between the weights and the fulcrum. The catch is then set by hand and the tap opened, when the syphon will act and draw off water from the air float, and will continue to do so until the minimum pressure has been attained, when the small bell will descend and set the levers in motion, and close the valve or tap again.

The automatic adjustment of the governor by which the pressure is varied is effected by the following apparatus:—A small tank K, fig. 2, and bell L (similar to those before described as mounted on the top of

Fig. 2.



the governor bell, but in this case fixed in any convenient place) are provided; the bell being suspended from a beam supported by a standard and counterpoised by weights at the opposite end. An ordinary clock is provided; and to the central shaft of it are fixed two jointed and weighted levers Q and R. According to the position in which these levers are fixed (and indicated by the hands) so do they each in their turn fall and strike one or other of two levers S pivotted to the standard. The opposite end of the lever struck has a wire or cord fastened to it, the other end being attached to the rod V of the valve W, through which the water is supplied to or withdrawn from the air-float of the governor. The clock therefore opens one or other of the valves. Beneath and attached to each end of the beam from which the bell is suspended, there is stretched a wire X, upon which a weight Y is free to slide. This weight is so arranged that on sliding it strikes against one of two arms A and B pivotted to the standard; and on one or the other being struck, it causes (by the rod or cord C) one or other of the levers D and E to rise, when the valve rod will fall, and the valve be shut, and so they will remain until again opened by the action of the clock. When the valve is opened, it is kept so by the weighted lever F, which draws a projection G until it rests under a corresponding projection H on the valve rod, and so supports it until released by the operation of the bell L through the beam above.

APPLICATIONS FOR LETTERS PATENT.

18,682.—RIGHTON, W. J., "Improvements in instantaneous water-heaters." Dec. 21.

18,721.—CROOKE, W. T., "Improvements in connection with gas fires and stoves." Dec. 22.

18,733.—SHIELS, A., "Shiels' patent non-smelling gas-stove." Dec. 22.

18,755.—AMAN, E. G., "Improvements connected with stop-cocks for gas-pipes and the like, by which the brilliancy of a gas-flame or the supply of gas from the main may be regulated or controlled at some distance from the point of supply." Dec. 22.

18,826.—BARRETT, J., "Improvement in lamp-posts." Dec. 24.

18,849.—EDWARDS, E., "Improvements in regenerative gas-lamps." A communication from Englebert, L. Dec. 24.

18,915.—GOOD, R., "A new or improved syphon and test-box for testing gas-mains, and for other purposes." Dec. 27.

18,963.—MASSON, C. E., "Improved means for obtaining a flame for the lighting of lamps, gas-jets, and other purposes." Dec. 28.

18,980.—WALDER, C. R., "Improvements in regenerative gas-lamps." Dec. 29.

19,005.—NICHOLLS, R., and KELLEY, J. F., "Improvements in regulators for gas-burners." Dec. 29.

19,013.—PINKNEY, C. W., "Improvements in gas-motor engines." Dec. 29.

19,055.—HOOKER, W., and MURRAY, D., "An improved incandescent gas-burner." Dec. 31.

PATENTS WHICH HAVE BECOME VOID.

[AFTER THE FOURTH YEAR.]

12,456.—BECK, W. H. (M'Carty), "Hydrocarbon gas."

12,471.—ROE, J. P., "Distribution of gas, &c."

12,677.—BESSON, H., and another, "Gas-governors."

[AFTER THE SIXTH YEAR.]

4489.—CROSSLEY, F. W., "Gas motor engines."

NORTHALLERTON WATER SUPPLY.—In response to the petition sent them by the Northallerton Local Board (see Vol. LII., p. 1038), the Ecclesiastical Commissioners have consented to let the Board take the water from their property at Oakdale, near Osmotherley, for the supply of the town. The consent is given in perpetuity, subject to the Board paying the nominal annual rental of £15.

NORTHERN COAL TRADE.—Although there is a smaller production of coal just after the holidays, there is rather less pressure in the demand, which is perhaps to be expected at this time of the year. Steam coal, however, continues in good demand; and commands from 9s. to 9s. 3d. per ton f.o.b. steamers. Small coal is being very largely produced; and there is some difficulty in selling the whole of the output, though more is now being used for steamers. Gas coal is still in full demand, though some of the collieries are now beginning to make up part of the arrears in back deliveries. A larger tonnage of coal will soon be shipped to some of the Italian ports; and this will give a brisk trade even when the home requirements begin to show signs of falling off, as ought to be the case in a week or two, when the days begin to lengthen. Household coal is very dull just now. Coke is steadily sold; and though the production of gas coke has been large of late, it has been very well taken up.

Correspondence.

[We are not responsible for the opinions expressed by Correspondents.]

THE POSITION OF THE GAS INSTITUTE.

SIR,—Since retiring from The Gas Institute, I have refrained from everything that might by any possibility be construed into a desire to interfere with the action of the Council or to influence any of the members in any way; but I have never ceased to feel a real interest in the welfare of the Institute, and to desire that it might be made a body worthily representative of the great gas-lighting industry.

That there never was greater need for a representative organization than at the present time appears capable of demonstration. All important industries and interests are thus represented; and their status in the public estimation, as well as their power of maintaining their position, are largely dependent thereon. But prosperous as is the gas industry, it has powerful opponents and strong prejudices to bar its progress; and it is now of especial importance that nothing should be done or left undone that might give the impression that gas has passed its zenith—which it certainly has not yet reached. Such an impression, however, would be produced by the failure of its representative institution, which has been for 25 years of incalculable benefit both to the industry itself and to those who have been entrusted with its management and working. A continuance of prosperity and advancement depend to a very great extent on the dissemination of knowledge which results from the free and unrestricted interchange of ideas, and the records of progress which have been the work of the Institute. And although the District Associations are very useful auxiliaries, they cannot possibly perform the work of a great organization which includes the whole body, or take the position in the public mind which is necessary for the due appreciation of the importance and strength of the industry represented.

The constitution of The Gas Institute was, and is, in one important particular unsound—a defect that was certain sooner or later to cause weakness and decay. I allude to the admission of traders; but in doing so, I must disclaim any intention to speak disrespectfully or in disparagement of that most important body of men. That the principle is wrong, however, is the almost unanimous opinion; and none have expressed it more strongly than some, if not all, of the remaining six members of the Council. This being so, the conclusion is inevitable. A thoroughly representative organization is necessary; but to be durable and useful, it must be freed from the inherent weakness of The Gas Institute. If the constitution of the Institute cannot be amended, the small band left on the Council are attempting to lead the most forlorn of forlorn hopes if they imagine they can make it a success under its present constitution; for their proposed alterations of rules are of no moment whatever, in comparison with the great reform that is needed. Probably they have arrived at the conclusion—and this is a mere guess on my part—that amendment is impracticable, if not impossible; and if so, dissolution and reconstitution on a sound basis is the only hopeful course. In the interest of the organization of the individual members and of the gas industry, this is the best solution of the difficulty; but should nothing of the kind be done, and *at once*, gas must have a representative institution, in which, in addition to engineers, secretaries, and managers, and their assistants, as members and associates, gas companies and corporations owning gas-works should also, if practicable, have an interest in promoting the success of the new Gas Institute, and thus improving the position of the gas industry, and the status of all engaged in its working.

Tunbridge Wells, Jan. 4, 1889. GEORGE LIVESEY.

SIR,—It cannot be too clearly understood that the rock upon which The Gas Institute has split is the question of the exclusion or otherwise of the trading element.

As to this, Mr. Henry Woodall and those who acted with him desired such a reconstruction as might have restored to the Institute its representative and national character; whereas the minority members, who accidentally form a majority, propose to relegate the extraordinary members to the class of Associates—a measure which is at once irritating and must be wholly futile.

As regards the new organization, the cardinal point of our policy is the entire exclusion of the trading element; membership being confined to those who are actively or professionally engaged in the conduct of gas undertakings.

Birmingham, Jan. 4, 1889, CHAS. HUNT.

SIR,—In order that some headway may be made before the annual meeting comes on, and that any uncertainty may be dispelled as to which side has got the most support, I beg to suggest that the minority left on the Council issue printed reply post-cards, requesting members to fill in "Aye" or "No" to the question, simply stated, whether he supports the continuance of The Gas Institute as presently constituted, or whether he approves of dissolution and reconstruction. The JOURNAL might be asked to allow the reply portion to be addressed to its office, as a neutral party, and to publish lists of the members voting on either side; the Past-President and President *pro tem.* acting as scrutineers. Thereafter, let the majority conduct the business of the next annual meeting.

As it is not desirable that any names be published in such lists, let each portion of the post-cards be similarly numbered, so that members retaining the portion addressed to them may recognize in the lists their number. For this purpose, their generous disinterestedness would be made prominent, if those gentlemen who may be members of the Institute by virtue of their being connected with the gas industry only as suppliers of materials, or as secretaries or treasurers of companies, and not gas engineers or managers, would refrain from voting on this occasion. Such a course would be most becoming on their part; and while I would earnestly desire to see a Gas Managers' and Engineers' Association formed, without any admixture of other professions whatever, I would also consider that a more central position for the managers of the United Kingdom for the head office than London should be fixed on—say, Liverpool—where the paid Secretary's office might be.

Glasgow, Jan. 4, 1889. WILLIAM KEY.

THE ELECTRIC LIGHT AND VENTILATION.

SIR,—In the war which is raging between the promoters of electric lighting and the gas companies, it appears to me that the latter are not taking sufficient to care to keep their powerful rivals at arm's length, by impressing upon the public that there are other issues at stake besides the question of cost.

In ninety-nine cases out of every hundred, those who talk or write on the subject seem to consider that, when the cost of production of electricity has been reduced to a point at which it can hold its own with gas lighting, then the all-important matter of the purity of air in our living-rooms—which is perhaps the most important question of the day—will have been solved, and that, with the abolition of gas, health and an increased span of life will ensue. A few moments' consideration will show the fallacy of this view, as, although the incandescent system of electric lighting does not tend to vitiate the atmosphere, it is equally certain that it cannot be used as an engine for ventilation; whereas, when gas is employed in the proper way, not only light, but ventilation can be ensured.

The non-consideration of this phase of electric lighting is a serious danger into which we are drifting, as, when the question of cost has been overcome, and when the householder has had his fears as to fire and the numerous other dangers attendant on this method of illumination sufficiently allayed to permit its introduction, then the absence of heat will lead to the belief that vitiation is also done away with, the question of ventilation will be shelved, and *paterfamilias* will again subside into a fool's paradise to breathe over and over again his own and other people's exhalations—a danger entirely obviated by the use of the best types of over-head ventilating regenerative burners, which not only give the highest service per cubic foot of gas consumed, but also remove their own products of combustion, as well as several thousand cubic feet of air per hour, at the same time drawing in fresh air to take the place of the impure air removed.

Is it not worthy the consideration of gas companies whether it would not pay them to keep their consumers informed as to the best types of burners to use in the consumption of gas? In most of the cases in which complaints are made as to the illuminating power of gas, inquiry shows that it is the burner and not the gas which is to blame; and many customers are lost, because they see a higher illuminating power obtained with oil and electric lights, than they can get from fishtail or batswing burners, which have been in use for an almost unlimited number of years—a state of affairs which could easily be obviated by a company's inspector examining the burners used every few months, and advising as to the best forms to be employed. Few consumers are so pig-headed as to prefer a burner giving a light of 3 to 5 candle power per cubic foot of gas consumed, when they can obtain a light of 10-candle power by using proper appliances.

Greenwich, Jan. 4, 1889. VIVIAN B. LEWES.

THE REMOVAL OF HINDRANCES TO THE CONSUMPTION OF GAS.—An esteemed correspondent (who has studied deeply the best means to push the sale of gas for all purposes) writes, *à propos* of the letter that appeared under this heading in the JOURNAL for Dec. 25, that it must not be forgotten that if no rent be charged for meters or stoves, consumers will keep them in places where they only want them for a short time in the year; but if they paid rent, they would prefer to run a piece of service-pipe from the present meter to having another at rent. Our correspondent has known this done often. As to no rent for cooking-stoves, he says, it would be ridiculous.

THE DISTURBANCE OF GAS AND WATER PIPES IN THE METROPOLIS.—A meeting of Holborn ratepayers was held last Wednesday—Mr. Gainsford Bruce, Q.C., M.P., presiding—in opposition to the proposed line of underground electric railway between Piccadilly and Holborn Circus. Mr. L. Isaacs, M.P., said that having regard to the enormous disturbance which the work would occasion, to the displacement of sewers and gas and water pipes, and to the injury which would be done to the business of the tradespeople, he strongly opposed the project. He did not think people would be much benefited by the railway. Mr. Hazard, one of the Directors of the Company, denied that the line would interfere with the sewers, or the gas or water supply, as provision would be made for the housing of the pipes. A Committee was formed to take the necessary steps for opposing the London Central Subway Bill in Parliament.

THE "ATKINS" FILTRATION SYSTEM AT SOUTHAMPTON.—Notwithstanding all the recent outcry concerning the new water supply works at Otterbourne (Southampton), says the *Hampshire Independent*, there is no need for the inhabitants to be at all alarmed either as to the quality or quantity of the new water supply. As regards quality, this assertion is borne out by Dr. Frankland, who visited the works a few weeks ago for the purpose of reporting on the "Atkins" system of filtration, as applied there to the whole of the water supplied to the town. Dr. Frankland's visit was due to the fact that these works constitute the largest of the kind in the world in which water is softened on a system; the filtering machinery, according to Dr. Frankland, removing nearly 2 tons of solids from 2 million gallons in 24 hours. He took two samples of water—one, before treatment, from the rising main as it discharges into the mixer; the other, after treatment, from the tank below the filter-house. These samples have been submitted to complete analysis, the results of which show that whilst the well water is extremely pure as regards organic matter, it contains such a considerable proportion of lime salts (principally the bicarbonate) that it is ill-suited for washing, steam, and most other domestic and manufacturing purposes. In the process of softening, however, these lime salts are for the most part removed; remaining upon the filters as insoluble carbonate of lime. Thus, while the proportion of carbonate of lime in the untreated water amounts to 23·93 parts per 100,000 (16·75 grains per gallon), in the treated water it is reduced to 5·67 parts per 100,000 (3·97 grains per gallon). In other words, every gallon of water is deprived of 12·78 grains of carbonate of lime; or there are removed from the 2 million gallons of water pumped every 24 hours no less than 3651½ lbs., or upwards of 1¼ tons, of carbonate of lime. After this treatment, the water is not only of excellent quality for drinking but also for all domestic purposes. The peculiar interest, says Dr. Frankland, attaching to these works is that the softening process is there carried out on a larger scale than anywhere else; yet no one can fail to be impressed with the automatic manner in which the work is performed, and with the small amount of attention which it requires. The eport is supplemented by tabulated results.

Miscellaneous News.

THE GAS COAL CONTRACTS OF THE LEEDS CORPORATION.

Mr. Lever's Reply to the Sub-Committee's Report.

In the JOURNAL last week, we made somewhat extended reference to the report of the Sub-Committee appointed by the Leeds Town Council to investigate the charges made by Mr. Ellis Lever last year in regard to the coal contracts. It will be remembered that the correspondence between the Town Clerk and Mr. Ellis Lever (which was embodied in the report) concluded with a letter from the former gentleman, dated Dec. 20; and in reply thereto, and commenting generally upon the report, Mr. Lever has addressed the following letter to Sir G. W. Morrison:—

Culcheth Hall, Bowdon, Dec. 29, 1888.

The Town Clerk, Leeds.

Dear Sir,—The receipt of your letter of the 20th of December was somewhat of a surprise to me, inasmuch as it was intended as a reply to mine of the 14th of November; and I had concluded from the long delay that the matter had been allowed to drop. I note that your letter omits the date of mine of the 14th of November.

Immediately yours of the 20th inst. came to hand, I hastened to reply to it; but, in doing so, I was placed at a considerable disadvantage for the following reasons:—1. Your letter contained no intimation whatever that the Sub-Committee had prepared and published a report introducing many matters not dealt with in your letter; and I therefore regarded the latter as being all I had to reply to. 2. I was not apprised of the Sub-Committee's intention to publish your letter at all. Under these circumstances, I felt bound to withdraw my letter of the 21st inst., in order that I might furnish an exhaustive answer, dealing with both letter and report. As your letter appears *in extenso* in the report, it may be convenient that I should treat it as part of such report, in the order in which it occurs.

The correspondence as given in the report is incomplete, notably by the omission of my telegram to you of the 9th of November, which ran as follows:—"Letter enclosed last night is a distinct denial of Mr. Lupton's statement to you and to me. If your Council, in the interests of the ratepayers, will allow me to examine coal tenders, contracts, and deliveries, as at Halifax, I will do so at my own cost, and furnish Council with a full and true report, which will be of considerable value to your borough."

I think it well, at the outset, to call attention to the constitution of the Sub-Committee, who are responsible for the production and publication of the report. Every member of that Sub-Committee is also a member of the Gas Committee; and at least two members are Directors or shareholders of a Colliery Company doing business with the Corporation. I do not think it right that any member of a Gas Committee should have an interest in collieries whence the Committee derive supplies of coal and cannel. Still less is it to be desired that gentlemen occupying such a position should be placed upon a Sub-Committee appointed to inquire into allegations concerning the coal supplies. But I object entirely to the verdict of a tribunal consisting exclusively of what it is fair to regard as, in some sense, interested parties. An inquiry being deemed necessary, it was, to say the least, unwise to constitute the Committee implicated its own judge and jury. My strong conviction on this point does not, however, prevent me from acknowledging with gratitude the fairness shown, and the kind assistance given to me, by more than one member of the Sub-Committee.

It is with considerable regret that I feel called upon to say that no such acknowledgments are due to the gentleman whose name is appended to the report as the Chairman of the Sub-Committee—Mr. Peter Gilston, Chairman of the Gas Committee—whose hostile attitude throughout has done more than anything else to limit the scope of the inquiry, and to render abortive such investigation as it was possible, under the unfavourable conditions, to make.

When, by your invitation, I went to Leeds, on the 20th of October, to meet the Mayor, Mr. Alderman Scarr, Mr. Gilston, and yourself, Mr. Gilston, as you will remember, declined to answer question after question of prime importance to the inquiry; and it was only by the intervention of the Mayor, and in face of Mr. Gilston's strong protest, that I was allowed to ascertain the stipulations of your coal and cannel contracts as to the quality of the materials. The prices I did not seek to know. But for the courtesy shown me by the Mayor and yourself, Mr. Gilston's unconcealed antagonism would have led me to relinquish my purpose at that early stage.

I wish to ask, in connection with the publication of the report, whether it was competent for the Sub-Committee to print that report, and to send it to the newspaper press in all parts of the country, without the sanction of the Council? Even the resolution of the Gas Committee adopting the report—quoted on the last page thereof—does not authorize or contemplate publication. To me, it savours of a deliberate attempt to damage my reputation; and the indecent haste displayed by the Sub-Committee in circulating the report publicly, evidences a desire to anticipate, and, if possible, to defeat the fair and impartial criticism to which I believe it would have been subjected in the Council.

The title of the report is incorrect and misleading. It runs: "Report of the Sub-Committee appointed to Investigate the Charges made by Mr. Ellis Lever in Reference to Gas Coal supplied to the Corporation of Leeds." Neither the investigation of the Sub-Committee, nor what are termed my "charges," had any reference to gas coal; the allegations contained in my report dealing only with two trucks of cannel, forming a part of two contracts amounting together to 15,000 tons, out of a total annual consumption of about 200,000 tons. The contracts made by the Gas Committee for the purchase of coal and cannel for the current year—including the balances of old contracts—amount in the aggregate to no less than 304,000 tons; and an investigation concerning 15,000 or 20,000 tons of this quantity is spoken of as if it referred to the entire supply of coal! In my report of the 25th of October, I state expressly that I have not examined the coal supply.

In considering the most important part of the Sub-Committee's report—viz., that which deals with the analyses of the picked samples of cannel, &c.—I shall consider first the yield and illuminating power of the gas, and the quality of the coke obtained, and, secondly, the impurities contained in the samples; and I propose to confine my remarks, for the sake of brevity, to the material supplied by the Howley Park Colliery Company.

I may state frankly, to begin with, that I have no belief in the reliableness of the tests made by Mr. Fairley; although in saying this, it is right to add that my information points to the fact—admitted by Mr. Fairley in his report—that the experimental apparatus invariably yields considerably higher results than can be obtained in ordinary working. The contracts stipulate that the materials supplied to the Leeds Gas Committee shall be free from bass, slack, bind, "hub," and other impurities. I am able to prove that the material which Mr. Councillor Hunt and I picked out as "hub," was really "hub" or "cannel bottoms"—the terms being synonymous. The results obtained from the Howley Park "hub" by Mr. Fairley, when he made a test in the presence of Mr. Paterson, are stated as 11,070 cubic feet of 28·6-candle gas per ton. Mr. Fairley's further test gave a result of 11,203 cubic feet of 28·1-candle gas per ton. Against these results let me place the sworn evidence of several experienced gas engineers and colliery proprietors, given in an action, tried at Westminster, before R. W. Collins, Esq., Barrister-at-Law, as Arbitrator in 1874-75. The action was to recover damages against the Howley Park Colliery Company for breach of contract in the non-delivery of 8150 tons of Howley Park cannel bottoms—the balance of a contract for 10,000 tons of that material.

Mr. David Swallow, who has been for nearly 50 years Manager of the Bradford Gas-Works, said that, having made tests for the purposes of the action, he found that "Howley Park cannel"—*i.e.*, pure cannel—"produced 11,892 cubic feet per ton, of 19·27 candles; bottoms, 11,042, of 15·75 candles. Mr. Smith, Manager of the Leeds Gas-Works] (since dead); assisted me in making the tests. The coke was worthless from cannel bottoms. As taken out of the retorts it was worse than worthless." (The saleable value of the coke is not given by Mr. Fairley.) "My experience of bottoms is about 15 candles. I consider 15·75 candles rather good for cannel bottoms, *as an experimental test, which are always higher than practical working gives.*" Mr. Swallow further said that what some people called "hub," and the Howley Park Company designated "cannel bottoms," he called "shale." Mr. Charles Alfred Craven, Engineer of the Dewsbury and Batley Gas-Works, stated that, as cannel was very scarce, owing to the coal famine, he went in 1872 to the Howley Park Colliery to inspect the "cannel bottoms" with a view to seeing what he could purchase. "We had them offered," he continues, "at 6s. per ton delivered at Batley Gas-Works. After inspection, I did not buy any. I reported to our Directors that they were not worth having. I tested a sample, and we got about 10,000 feet of 16-candle gas. I assisted Mr. Swallow with the testing of the samples (for the purposes of the action); and I agree with him in the conclusions he came to. I do not think it possible to produce better results from Howley Park 'hub' than from Howley Park cannel; in fact, I am positive it could not be done. I would not believe my own father had he told me. The coke was worse than valueless. Howley Park cannel was offered to us at 15s. delivered at the work; and I advised our Directors to buy it in preference to the bottoms" (at 6s.). Mr. John Arnott, Consulting Gas Engineer, of Leeds—late Manager of the Newcastle and Gateshead Gas-Works for 18 years, and afterwards Manager of the Leeds Gas-Works for three years—said: "I obtained from Howley Park *cannel* 10,500 feet of 22-candle gas; from 'hub,' 8600 feet of 14 candles; coke of no use from 'hub.'" In referring to more recent tests made with reference to the action, Mr. Arnott said "Howley Park 'hub' gave 8320 cubic feet of 13·5 candles. 'Hub' or bottoms requires more labour and more plant than cannel to make a given quantity of gas. No Yorkshire *cannel* will produce 29-candle gas." Mr. Joseph Fearnsides, the Managing Partner of the Howley Park Colliery, said: "Unless all the evidence I have called is incorrect, it [the cannel bottoms] must have been very inferior stuff. Cannel with the 'hub' cannot be better than the cannel itself. The result from cannel alone must be twice as good as from a mixture of half 'hub' and half cannel." Mr. John Hudson, Head Book-keeper for the Howley Park Company, said: "We have given away many a score of tons of cannel bottoms. We used to let people take away a cartload or a barrowful as they chose. No one would purchase them, because they made so much dirt." Mr. Andrew Jackson, Bottom Steward for the Howley Park Company, stated: "I have turned men away for sending out this 'hub' with the cannel."

There is a singular discrepancy between this evidence and the results obtained from precisely the same material by Mr. Fairley; and, as the evidence was given on behalf of the Howley Park Company, its value cannot be denied. The absence of any reference in Mr. Fairley's report to the marketable value of the coke is striking. It is, however, to be noted that while the coke obtained from carbonization of the Howley Park pure cannel is stated by Mr. Fairley to contain only 17·5 per cent. of ash, that produced by the "hub" contained 28·75 per cent., or 64 per cent. more than that yielded by the pure cannel.

I will not add to the length of this letter by commenting upon the extraordinary results in yield and illuminating power shown by these analyses; but will leave the evidence I have quoted to speak for itself.

With regard to the sulphur contained in the Howley Park "hub," Mr. Fairley states the quantity of sulphur per ton of this material to be 64·11 lbs., while that contained in the Howley Park pure cannel is 52·3 lbs. Mr. Thomas Hawksley, the well-known authority on gas making, stated before a Committee of the House of Commons on The Gaslight and Coke Company's Bill, in 1877, that "the best coals do not contain more than 40 lbs. of sulphur per ton." Surely material which, according to Mr. Fairley's analysis, contains 60 per cent. more sulphur than the "best coal," should not be received and paid for at the price of good cannel.

Coming now to your letter of the 20th inst., I have to remark that your statement that "the 'hub' which you picked out as worthless, has proved on being tested . . . to be really the best gas coal, and better than that which you selected as pure cannel," is entirely controverted by the evidence hereinbefore recited. You refer to the question of my being "allowed to take away samples for Mr. Paterson's analysis at Warrington." Allow me to call your attention to the resolution passed by the Sub-Committee on the 30th of October, as follows:—"Resolved,—That a report of the day's proceedings be sent to Mr. Ellis Lever, and that he be informed that the material was at his disposal for the purpose of being tested by any analyst whom he might think fit to name;" and also to the last paragraph in your letter to me of the 31st of October: "They instruct me to say that they are quite prepared that the material shall be at your disposal to be submitted to any analyst of standing whom you may choose to name." The obvious intention was that I should have samples placed at my disposal to be tested *anywhere;* not necessarily at the Leeds Gas-Works. And yet, in the face of their own resolution, the Sub-Committee, on the 7th of November—when I attended at the gas-works with Mr. Paterson for the purpose of obtaining samples to take to Warrington for analysis—declined, on the objection of the colliery proprietors, to carry out their determination, and to allow me to have the samples. I am of opinion that the objection of the colliery proprietors was a pre-arranged plan on the part of some one to prevent my having what I required; and that the objection of the colliery people should have had no weight, since the material in question was the property of the Corporation.

As to Mr. Paterson's being perfectly satisfied with the analyses, it will not be denied that he stated to the Sub-Committee his inability to make complete tests in less than three or four days. I observe a note appended apparently by the Sub-Committee to the joint report of Mr. Fairley and Mr. Paterson, and reproduced in your letter in the following terms: "Mr. Paterson expressed his opinion that no good could now come of having a portion of the cannel conveyed to Warrington for further tests." Since this remark forms no part of Mr. Paterson's report, but is merely hearsay evidence, it does not appear to demand comment. Further, the selected materials, which were sent to Meadow Lane Gas-Works on the 24th of October, for "safe custody," were—as I learned to my astonishment—

overhauled by the Sub-Committee and the colliery proprietors on the 30th of October, and "preliminary tests" were made. Mr. Fairley goes to some trouble to make it clear that these samples were handed over to him by Mr. Lupton on the 1st of November, and that they "had been, I was informed, carefully kept in the charge of certain persons at the works from the time the samples were in the presence of Mr. Ellis Lever. The samples in bags," continues Mr. Fairley, "were placed by me in the sample room adjoining the experimental works at Meadow Lane. The door of this room was locked; and the only key kept in my possession." So that from the 24th of October to the 1st of November the samples were at the tender mercies of "certain persons at the works;" and it was only on the latter date that the elaborate precautions which Mr. Fairley details with such simple candour were found desirable. I do not question the desirableness of these precautions; but I do seriously question their efficacy, after a lapse of more than a week.

The Sub-Committee's conclusion is that, "After consideration of the whole matter, and especially bearing in mind the analytical results already obtained, they are unable to see what useful purpose could be served by any further investigation" on my part. I shall await with some interest the Sub-Committee's utterances on this point, after they have had an opportunity of gauging the value of the "analytical results" on which their decision is based, in the light of what I have written and the sworn evidence of experts.

In conclusion, I beg to say that it is almost incredible that a gas-works situated, as is that at Leeds, in a most favourable position for obtaining good and cheap supplies of coal, should have been worked for the 4½ years ending 1887 at a loss of nearly £50,000! If the leakage does not occur in the coal and cannel purchases, where is it to be looked for?

Mr. Lupton, who has doubtless had a considerable share in the attempt to discredit me and my statements, really proves my case in a paragraph published by him in the *Yorkshire Post*, on the 19th of November, to the effect that "22 per cent. of inferiority had been discovered in the coals of the Howley Park Company prior to the assistance volunteered by Mr. Lever." I am in possession of reliable evidence that out of 24 kinds of coal and cannel delivered under contracts and tested at the Leeds Gas-Works during the year 1886-7, at least half were found to be considerably inferior to the samples on which the purchases had been made. I should like to know whether any deductions whatever have been made from contractors' invoices in respect of these proved inferiorities.

At a meeting of the Leeds Town Council, on the 14th of November, Mr. Councillor Willey—one of the Sub-Committee of Investigation—said that "The ratepayers of Leeds had been paying thousands of pounds for coal, value for which they had not received. Since January last, at least one-third of the coal which had been passed into stock as equal to sample, was below sample from 2 to 15 per cent. In some cases the quality was 22 and 29 per cent. below sample. He asked Mr. Lupton, the Secretary, what course was taken in such matters, and was told that a letter of complaint had been written, and that no deduction had been made. In his opinion, the Committee would have acted properly if they had deducted the difference in value between the coal ordered and the coal supplied. It appeared to have been the practice never to present the tests to the Committee at all, but to send them up to Mr. Lupton, who gave them to the Chairman of the Committee [Mr. Councillor Gilston], and there the matter ended."

It is for the Council and the ratepayers of Leeds to decide whether such matters as that referred to by Mr. Willey—whether, indeed, the investigation into the whole subject of the coal and cannel supply—shall be thus permitted to "end" with Mr. Gilston. I venture to think that the process of "burking," which has brought the gas question at Leeds within the range of "gas scandals," will be universally and emphatically condemned, and that daylight (followed by greatly improved gaslight) will yet find its way into the dark places of Leeds.—Yours faithfully,

(Signed) ELLIS LEVER.

At the Monthly Meeting of the Leeds Town Council last Wednesday, Mr. GILSTON moved the adoption of the proceedings of the Gas Committee. He had told them, he said, that a report would be prepared; and they had now seen it. He did not know if there was any intention of discussing it then. (Cries of "No, no.") He would say no more then.

Alderman EMSLEY asked whether Mr. Lever complained at the time the analysis of "hub" was made by the Borough Analyst (Mr. Fairley) and his own Chemist (Mr. Paterson) that the lumps of coal were not the same as those he had picked out beforehand.

Alderman LOWLEY said Mr. Lever made no complaint whatever.

The MAYOR, in putting the motion to the Council, congratulated the members upon the fact that Mr. Lever had been unable to substantiate the charges he had made against certain contractors of coal to the Corporation, and that the Gas Committee had come out so well.

The minutes were then adopted.

The following telegram from Mr. Ellis Lever, commenting upon the remarks made at Wednesday's meeting of the Leeds Town Council, was published on Friday last:—"Alderman Lowley is mistaken in saying that Mr. Ellis Lever made no complaint at the time when the alleged analysis took place. Mr. Lever protested that the sacks of 'hub' and 'slack' which he and Mr. Hunt had assorted had been tampered with. Mr. Lever complained that the marks placed upon the sacks had disappeared; and on its being stated this had occurred through the emptying and re-filling of the said picked sacks in Mr. Lever's absence from Leeds, Mr. Lever declared that he had no proof that the material was what had been selected. Mr. Lever says the Mayor may congratulate the Council; but it would have been much better if he could have congratulated the ratepayers on the result of this so-called investigation. Mr. Lever has in his possession abundant documentary evidence showing how, for a long period, inferior coal has been delivered and paid for as if it had been of the quality contracted for. It is to be regretted that Mr. Lever's offer to examine further and give a full written report of his investigations as to the coal and cannel supply should not have been accepted; and it is certainly not in the public interest. Mr. Lever proved Mr. Gilston to be utterly wrong in his statements, as to certain kinds of cannel at York Street works, as was admitted on the spot by the retort men who were unexpectedly questioned by Mr. Lever. The decision of the Gas Committee and the Council is a misfortune to the gas consumers and ratepayers of Leeds."

DONCASTER CORPORATION WATER SUPPLY.—At a special meeting of the Doncaster Town Council, on Monday last week, Alderman Smith reported that the quantity of water in the Thrybergh reservoir on Dec. 31, was 168,556,986 gallons, and that the water was only 7 ft. 3 in. from the top level. The total consumption of water during the year from Thrybergh and Hexthorpe had been 177,182,000 gallons; and, in consequence of the restricted supply during part of the twelve months, there had been a saving of 11,452,000 gallons. It was also satisfactory, he said, to know that the income from the supply of water was considerably increasing.

SALFORD CORPORATION GAS SUPPLY.

MR. ELLIS LEVER'S CHARGES.

At the Meeting of the Salford Town Council last Wednesday—the MAYOR (Mr. Alderman Dickins) presiding—the following letter from Mr Ellis Lever, which had been addressed to the Mayor, was read:—

Bowdon, Jan. 1, 1889.

Dear Sir,—At the last meeting of the Salford Town Council, Mr. Rycroft expressed a hope that, in the interests of the ratepayers of Salford, I might be inudced to reconsider my decision with regard to the gas matters. I have given the fullest consideration to the subject, and decided some ten days ago to give the Corporation all the assistance they might desire. If the Corporation will accept my nomination of Mr. Councillor Phillips, Mr. Councillor Rycroft, Mr. Councillor Lord, and yourself as Chairman, I shall be prepared to meet such a Committee, provided that any information I afford them shall be treated as strictly confidential and privileged. In order to prevent any misapprehension, I desire to say that I have never attributed nor suggested fraud on the part of any member of the Salford Corporation.—Yours faithfully,

ELLIS LEVER.

The MAYOR said he did not think they ought to thwart Mr. Lever in his intention. At the same time they ought to know what he meant by "strictly confidential and privileged," because, if the communication was made "strictly confidential and privileged," he did not see how they could make use of it. If they were going to charge a person with fraud, he would want to know what evidence they had to offer; and if they had to offer any evidence at all, it must come from Mr. Ellis Lever. It might, perhaps, be well if they wrote to Mr. Lever saying that they would gladly accept his nomination; but would first like to know what he meant by "strictly confidential and privileged."

Mr. RUDMAN proposed that the members named by Mr. Ellis Lever be appointed a Committee for the purpose of placing themselves in communication with him through the Town Clerk, considering his proposal, and accepting it or otherwise.

Mr. ROPER seconded the motion.

Mr. SHAW remarked that he did not see why they need trouble themselves about the matter, particularly in view of what had recently appeared in the newspapers. If Mr. Ellis Lever treated the Corporation as he had Leeds, the matter was scarcely worth being in a hurry over.

Alderman KEEVNEY observed that Mr. Ellis Lever had already objected to the presence of a reporter when the matter was being investigated. He would like to know whether Mr. Lever insisted upon his objection to having a reporter present to record what passed between the members of the Committee and himself. It was desirable that these statements of Mr. Lever should be tested to the very foundation.

The motion was unanimously agreed to.

Notice had been given by Mr. B. Robinson of the following resolution; but the Mayor suggested its withdrawal in view of the letter that had been received from Mr. Lever:—"That in consequence of Mr. Ellis Lever declining to give any information to the Special Committee appointed on his own terms respecting the alleged frauds in connection with the Gas Department, this Council now demand that Mr. Lever give evidence or furnish information that will substantiate the charges made in his letter to the Manchester papers, dated Sept. 25, or, failing that, he be called upon to withdraw the charges, and make a satisfactory apology to the Council."

Mr. ROBINSON thought that the publication of the motion in the newspapers had had the effect of bringing Mr. Ellis Lever to a sensible conclusion. If there were frauds or irregularities going on, it was the duty of Mr. Lever as an honest man to come forward and give information in such a manner that the irregularities might be checked, and the culprits brought to justice. He simply withdrew his resolution for the present; but he hoped the occasion might not occur when it would be necessary for him to bring it up again.

HALIFAX CORPORATION GAS SUPPLY.

A COMPARISON OF COST OF MANUFACTURE.—THE COAL CONTRACTS.

At the Monthly Meeting of the Halifax Town Council last Wednesday—the MAYOR (Mr. Alderman J. Booth) presiding—the above subjects occupied the attention of the members.

An analysis of the cost of gas for the fortnight ended Dec. 12 last, as compared with the cost for the corresponding fortnight in 1887, was submitted. It was as follows:—

	1887.		1888.
Gas made	35,420,000 ft.	..	35,155,000 ft.
Wages, manufacture, and general workmen	£486 15s. 5d.	..	£515 17s. 6d.
Cost per 1000 cub. ft. in labour	3·30	..	3·52
Coal, &c.	3123 tons.	..	3463 tons.
Cost of coal	£1452 7s. 6d.	..	£1532 14s. 7d.
Cost per 1000 feet in coal	9·34	..	10·46
Cost in labour and coal	13·14	..	13·98
Quality in candles	17·45	..	17·06
Yield	11,341 cub. ft.	..	10,151 cub. ft.

Alderman LONGBOTTOM called attention to the fact that, with an increased cost, the yield, both in quality and quantity, was less. He asked if the Gas Committee could give any explanation respecting it.

The MAYOR replied that the Council would be aware that the Committee had been using a large quantity of coal which had been in stock for some five or six years. It was well known that coal did not improve in quality by being kept; and the results were partly due to this. Another reason was that they had been having some of the regenerator furnaces reconstructed. There was also another important consideration with respect to the cost of carbonizing the coal. The method hitherto pursued as regards this process was one calculated to mislead; other extraneous things having been put into the account. They were taking care that in future the carbonizing accounts should be distinctly and separately kept. If last year the illuminating power of the gas had been put down in a similar way to what it had been recorded lately, it would not have shown so well as it did. The Gas Manager was instructed to get the illuminating power up to 19 candles. He might state also that the bad light complained of at present did not arise from want of illuminating power, but from want of pressure, which just at this season usually existed. The Council might trust the Committee to do everything possible to carry out the work in an efficient way.

Alderman LONGBOTTOM was proceeding to put further questions on the subject, when

The MAYOR (interrupting) said that if the answer he had given was not satisfactory, he must ask Alderman Longbottom to give notice of any further questions.

The TOWN CLERK then read the following "joint communication from Mr. Paterson, C.E., and Mr. Hayward, C.E., in reference to the gas scandal," which was addressed to the Mayor:—"Sir,—We have examined the coal and cannel contracts entered into by the Halifax Corporation between the years 1879 and 1888. We find that the Corporation, acting on the advice of its officers, has, in our opinion, sustained a loss of at least £25,000 upon their coal and cannel contracts during the above period."

Alderman RILEY remarked that he should like to say a word with regard to this letter. He did not intend to make many observations;

but he saw that one of these gentlemen signed his name "S. Hayward, C.E." Of course, any man might sign himself C.E. who set a grate or mended a lock; but his (Mr. Hayward's) name was not in the list of members of the Institution of Civil Engineers. Now, Mr. Hayward made it out that a loss of £50,000 had been sustained; and perhaps if they waited until Friday, it might be £50,000 more. He found that since 1879 the Corporation had paid for coal for the gas-works £148,000; and the Halifax people were asked to believe that they had been paying 33 per cent. more for the coal than they ought to have paid. He was also told that neither of these two gentlemen had made any tests, but had gone on the lines of the tests submitted to them. With respect to Mr. Hayward, he did not think he was a gentleman of the calibre usually employed by the Corporation.

Alderman D. Smith thought the analysis might have been made at less expense, and with more reliable results. He did not think for one moment that any such loss had been sustained; considering that originally they were paying 4s. per 1000 cubic feet, and that the price was now brought down to 1s. 9d. per 1000 feet.

Alderman Riley: Yes; and £50,000 profits besides.

Mr. Oswin inquired if these gentlemen had explained how the money had been lost.

Alderman Longbottom said the Council had now waited for something like four months for a report from the Sub-Committee appointed to consider this subject; yet they remained quite in the dark as to what was to be done, and also as to the particulars of the charges brought by Mr. Fox. He should like to ask if the Sub-Committee had any details as to commissions alleged to have been received by Mr. Carr and paid by Mr. Wrigley, and also what were the malpractices alleged against Alderman Riley. He wished to know if these particulars had been obtained; and if so, could they be supplied to the Council. He also deprecated the communication of reports to the newspapers, and not to the Council. It certainly was time the Council had a report from the Sub-Committee.

The Mayor thought it would be imprudent to lay before the Council at the present time the information asked for; and for this reason: They were threatened with an action. Whatever charges might be brought against him, he could assure the Council that he was acting impartially in the matter—entirely in the interests of the Council, and for the good of the people of Halifax.

The Town Clerk asked Alderman Longbottom what he would like included in the report. The contract they entered into with Mr. Fox had been carried out, and was at an end. Mr. Fox agreed to give the names of the parties against whom charges could be brought; and on the Council giving the indemnity asked for, he gave the names of those gentlemen. Particulars of the charges could be obtained in less than a fortnight by any of the parties implicated commencing an action, and demanding the particulars. If he was instructed by the Council to ask Mr. Fox for particulars of the charges, he would be in a position to say: "I am under no obligation to give them to you. Let those gentlemen I have named commence proceedings, and demand particulars of these charges; and I shall be obliged to furnish them." It would be undignified on the part of the Council to ask Mr. Fox for the particulars. If he chose to give them voluntarily, that was another matter. In reply to a further question, the Town Clerk added that he understood certain members of the Council had asked Mr. Fox to give the particulars; and he had refused.

The matter then dropped.

LEEDS CORPORATION GAS SUPPLY.

Apart from brief reference (alluded to elsewhere) to the gas coal contracts question at the meeting of the Leeds Town Council last Wednesday, a question as to certain alleged "irregularities" at the York Street Gas-Works was under notice. The minutes of the Works Sub-Committee for this station contained an entry to the effect that, at the meeting on the 10th ult., inquiry was made as to a hole having been enlarged on the top of one of the gasholders; and a resolution was passed directing that a letter should be written to Mr. E. J. Lloyd, the late Manager, asking him whether he remembers giving instructions for this to be done, and if so, with what object, and as far as he could remember, on what date. On the 18th ult. Mr. Lupton reported that he had written to Mr. Lloyd, as directed, and had received from him this reply, dated Bristol, Dec. 12: "Yours of Dec. 11 to hand. If I can get the permission of my Directors, I shall be pleased to give the Committee any information or advice that they may require, upon their agreement to pay the usual professional charges. You seem to have forgotten that I left the service of the Leeds Corporation on the 30th of September last." The Committee then resolved—"That a letter be sent to Mr. Lloyd embodying the information obtained by the Committee at the works at the last meeting, and intimating to him that the Committee desire to be supplied with any explanation or remarks which he may have to make thereon, prior to making their report upon the excessive leakage of gas which has taken place."

Alderman Spark, calling attention to the minutes, said a great deal of credit had been taken for gas which had not been made; and unfair comparisons had been drawn between the quantity of gas manufactured per ton now and when Alderman Bower and himself were members of the Committee. It seemed that the Managers of the different gas-works had been put upon their mettle to see which could produce the largest quantity of gas per ton of coal; and the irregularities referred to were the outcome of this policy. At the York Street works gas had been made of inferior quality, and registered as having been made; and after it had passed through the station meter, it had been blown off into the air. The result was that the Committee had been deceived into thinking that a larger quantity of gas was being made than was really the case. In the present aspect of the gas question at Leeds, such a state of things would produce a bad result; and he wished to know whether any action was being taken in the matter.

Mr. Hunt, the Chairman of the York Street Committee, explained that the matter was still under investigation.

Mr. Gilston, the Chairman of the Gas Committee, characterized Mr. Lloyd's letter as studiously insulting; and said the Committee were determined to obtain an explanation from him.

The subject then dropped; and the Council proceeded to other business.

The Rastrick Water Company and the Local Board.—At the meeting of the Rastrick Local Board last Wednesday, the Gas and Water Committee recommended that notice be given to the Halifax Corporation, under section 52 of the Public Health Act, 1875, to supply water for domestic purposes, under section 62 of the Halifax Improvement Act, 1853; and that the Clerk forward a letter to the Rastrick Water Company, negotiating for the purchase of their undertaking. These minutes were confirmed. A resolution was also unanimously passed authorizing the Board to oppose in Parliament the Bill proposed to be introduced on behalf of the Rastrick Water Company; and a Special Committee was appointed to take all the necessary steps.

GLASGOW CORPORATION GAS SUPPLY.

The Proposed Purchase of the Partick, Hillhead, and Maryhill Gas Company's Works—A Grant from the Profits.

At the Meeting of the Glasgow Town Council last Thursday—the Lord Provost (Sir James King) presiding—considerable prominence was given to gas affairs.

Mr. Caldwell, referring to the resolution of the Council as to the purchase of the works of the Partick, Hillhead, and Maryhill Gas Company,* asked, seeing that the resolution was conditional, and dependent on the annexation of the suburban burghs and districts, and that this was not to be gone on with at present, if the resolution should be continued in force, or allowed to lapse until such time as it might be renewed, or they knew what was to be done.

Mr. Ure, Convener of the Gas Committee, said that it was stated in the minutes that the shareholders of the Gas Company had not approved of the provisional arrangements come to between the Directors and the Gas Committee; so that the matter fell to the ground.

Mr. Caldwell remarked that it was not the shareholders that he referred to; but the resolution of the Council.

Mr. Ure replied that the whole thing had collapsed.

The Lord Provost said that, as the offer of the Town Council had been refused by the shareholders, it was no longer binding on the Council.

Mr. Ure remarked that the Council had been under the impression that, in order to facilitate annexation, they had been offering very liberal terms to the Gas Company. Since the provisional arrangement had been broken through, he was glad that it was not by the Town Council, but by the shareholders, who would not, he hoped, live to regret what they had done. But this remained to be seen in the future.

It was stated in the Gas Committee's minutes that the Chairman having, under the remit to him and Bailies M'Farlane and Simons on the 27th of March last, reported the result of their interview with the representative Committee regarding the allocation among the different Municipal Trusts of the parliamentary expenses incurred by the Corporation for sessions 1885-6 and 1886-7, the Committee authorized the Treasurer to pay the Chamberlain the sum of £1070 15s.; being the sum which had been fixed upon as the proportion falling to be paid by the Gas Trust. Mr. Ure had also moved at a meeting of the Gas Committee on Nov. 29, that, in virtue of the powers contained in section 86 of the Glasgow Corporation Gas Act, 1869, the sum of £3000, being part of the balance standing at the credit of the Gas Trust accounts for the year ending May 31 last, be paid over to the Corporation for their general purposes. This motion was carried in Committee by seven votes against four in favour of an amendment moved by Bailie Paton.

Mr. Ure, in moving the adoption of the minutes, explained why this grant was made to the Corporation. He said the representative Committee had allocated to the Gas Committee the sum of £4070 as their share of the parliamentary expenses. Hitherto these general accounts for the promotion and protection of the interests of the city had been paid from the "Common Good" of the city, or from the Corporation funds. The fact was that the "Common Good" of the city had been heavily drawn upon during the past two years—first, with the Jubilee year, and then this year with the Exhibition and the Royal visits. It would be in the recollection of the members of the Council that Treasurer Richmond had stated that there was a deficiency between the revenue and expenditure of the "Common Good" for the past year of £12,000. The Committee thought, under these circumstances, they would be justified in taking advantage of the clause in their Act, and making this vote. He further stated that the Committee did not consider they could legally pay £4070 as their share of the parliamentary expenses; but to overcome this difficulty, they agreed to pay £1070, and to give a grant of £3000 to the Corporation.

Bailie M'Pherson having seconded the motion,

Bailie Paton moved that the sum of £3000 be not granted to the Corporation as proposed. He made a forcible speech in support of the position which he had taken up; and, in the course of his remarks, urged that the only use to which a gas surplus should be applied was a reduction of the price of gas. He considered the Committee had proposed an extraordinary course, and one which should not be adopted.

Ex-Bailie Neil seconded the amendment, contending that the Gas Committee had no right to make such a recommendation as was contained in the minutes, and that its adoption would be to the detriment of the ratepayers.

Mr. Martin said he objected to money being taken out of the gas funds, except for a reduction in the price of gas. Until a few years ago, it was always the case to apply the profits to this purpose. This proceeding of the Gas Committee was robbing the gas consumers of their rights.

The Town Clerk (Sir James Marwick), at this stage of the discussion, gave his opinion in regard to the powers of the Gas Trust in the way of voting surplus profits, and referred to the practice in certain other large towns where the gas supply is in the hands of the municipal authorities. His interpretation of certain portions of the Corporation Gas Act seemed to have considerable influence upon the subsequent discussion, which was of somewhat unusual length.

When the division was taken, 31 members voted for the adoption of the minutes, and 12 for Bailie Paton's amendment.

MANCHESTER CORPORATION GAS SUPPLY.

The Bradford Road Works.

At the Monthly Meeting of the Manchester City Council last Wednesday—the Mayor (Mr. Alderman Batty) presiding—on the presentation of the minutes of the Gas Committee, some discussion took place on the management of, and the necessity for the Bradford Road Gas-Works.

Mr. J. W. Southern inquired whether Mr. J. Woodward had been placed in charge of the Bradford Road Gas-Works as Manager.

Alderman Sir John Harwood remarked that the Gas Committee should only manufacture as much gas as could be sold, and not make gas to be thrown away. These works were not needed, and never had been except for the purpose of making gas in very bad weather, and would not be required then if they had sufficient space for holders.

Mr. Pingstone said the producing power, exclusive of Bradford Road works, was practically 14 million cubic feet per day, which he understood to be sufficient for the supply of Manchester.

Alderman Asquith stated that Mr. Woodward was merely engaged temporarily, and not as Manager, but as Foreman over the 130 or 140 men employed there.

The Mayor was of a different opinion to Sir John Harwood about the Bradford Road works. He was satisfied that with the make of gas before the works were erected, they could not have met the demand of Manchester and the neighbourhood even with increased storeage, and they still could not do without these works for the manufacture of gas in the depth of winter.

Alderman King said that 14 million cubic feet was the maximum

* See Journal, Vol. LII., p. 726.

amount of gas they could make at present with the Rochdale Road and the Gaythorn works. On an extremely foggy day last year, the consumption was within a few feet of 20 millions. In January last year, there was only half a million cubic feet of gas left in the holders; and if a fog had continued, they would only have had what gas was coming out of the retorts to supply the demand. They could provide for this with large holders; but the principle substantially recognized by all great gas companies was that the holder room should be equal to one day's consumption. So far from these works being useless, they were actually making 4 million feet a day. It was suggested that they should have extra holders. The Committee had enlarged their holders, and had obtained an increased storeage capacity of 700,000 cubic feet. They were anxious to do more; but that would not enable them to do away with the works. The appointment of a Manager had been rescinded by the Committee; and the present was a temporary engagement.

Alderman SMITH thought Mr. Alderman King had been "bamboozling" the Council. There was, he said, considerable opposition to the taking in hand of these works; and they were entered upon in spite of the objection of a large minority of the Council. The scheme had been a very expensive one, and might be said to have been almost unnecessary, though not quite.

Mr. CLAY contended that the works had been useless. They were practically a "white elephant" in the hands of the Council ever since the land was purchased, and they began to erect the works. They saw here the folly of placing in two or three hands such an important matter as the purchase of land for a large extension of their gas-works in a certain neighbourhood.

Alderman THOMPSON, as an old member of the Corporation and of the Gas Committee, said he might be allowed to say that the Council had not been informed on one point. Supposing a mistake was made in going to Bradford Road and in not developing the Rochdale Road works, why were not the latter developed to their utmost capacity? Because the Committee of that day was utterly powerless to do what had been done since. In a very few years the demand would have greatly overtaken the supply; and the Committee felt themselves in great straits. Wishing to know how they could meet the demands of the community, the Committee went to the Lancashire and Yorkshire Railway Company to ask for further accommodation. The Company had then only one outlet to the Lancashire and Yorkshire line on the steep gradient from Victoria Station to Miles Platting; and the amount of traffic on that particular reach of line was very large and steadily increasing. The Company were obliged to tell the Corporation that they could not give them another foot for their works. Then what could be done? He believed the Committee of that time acted prudently, and to the best of their judgment for the benefit of the ratepayers. He understood that one-fourth of the gas was produced there; and the works were therefore not quite useless.

Alderman HOPKINSON said all that had passed in regard to these works had not changed the conviction in his mind, that what was done at the time the works were erected was prudent, and that the site was the best. Some gentlemen had demonstrated entirely to their own satisfaction that these works were useless and that it was not worth while to appoint a Manager for them. If the works were useless, why should they not follow a logical course, and stop them to-morrow?

Alderman LAMB thought it was a pity the question put by Mr. Southern was not answered at once. The present was only an experiment. There had been a difference of opinion whether they should appoint a Manager or not; and the experiment was only to extend to March.

The MAYOR said he was sorry to hear the word "bamboozling" used in the discussion. He was quite sure that neither Mr. King nor any other member of the Gas Committee had "bamboozled" the Council.

The minutes were then adopted.

Alluding to the debate reported above, the *Manchester City News* says: "The discussion in connection with the appointment of a Manager to the Bradford Road Gas-Works showed that the opinion of the whole of the Council has almost come round to the view we took long ago—that the works were unnecessary, and their site a blunder. The works ought never to have existed. Alderman King and his colleagues in the blunder, of course, again defended the construction, as they have done before; but their defence only showed that the Council might have provided for the requirements of the city without spending thousands on an unsuitable site. Half-a-million has been lost, and nothing can bring it back. It is too late to grumble; all that can be done is not to make the blunder worse by laying out more money upon the works. This the Council in its present humour is not likely to allow. It has learned by experience."

WIGAN CORPORATION GAS SUPPLY.

RE-APPOINTMENT OF THE GAS INVESTIGATION COMMITTEE.

At the Meeting of the Wigan Town Council last Wednesday—the MAYOR (Mr. W. Rogers) presiding—the question of the re-appointment of the Gas Investigation Committee gave rise to some discussion.

Alderman SMITH, in moving the adoption of the minutes of the Gas Committee, said the Council would see from the report of the Gas Engineer that the works were in a most satisfactory condition; and he hoped at the end of the financial year that their anticipations with regard to the profit on the gas estate would be realized.

Mr. JACKSON asked, with reference to the resolution of the Gas Committee to recommend the Council to re-appoint the Gas Investigation Committee, whether that was to be an annual thing or not, and were the Council ever to know the particulars of the investigation? He was in hopes that day that they would hear something about the matter; but they were "swamping" it again.

Alderman SMITH said the resolution as to the re-appointment of the Investigation Committee would be moved separately; and then Mr. Jackson would be quite in order to ask the question.

The minutes were confirmed.

Alderman SMITH then moved—"That a Committee be appointed to complete the work of the Gas Investigation Committee appointed by the Council on the 30th of January, 1887, and that the Committee consist of the following persons—Messrs. Park, Ffarington, Chalk, Halliwell, Lavland, Johnson, Richards, Ackerley, Lamb, Stuart, and Holmes." He remarked that several matters in connection with the investigation had not been cleared up. One or two important contracts had not been settled; and it would be a very difficult matter indeed for the Gas Committee should they take the matter in hand now. It would be injudicious; and the Committee resolved to recommend the Council to appoint the whole of the gentlemen who were on the previous Investigation Committee, with the exception of Mr. Worthington, whose place they suggested should be filled by Mr. Holmes.

Mr. JACKSON inquired whether it would be detrimental to the interests of the Corporation if any particulars were given to the members.

Alderman SMITH replied that the Gas Committee were not in possession of the particulars. The matter had been in the hands of the Investigation Committee; and it would be a great misfortune for it to be taken out of their hands. The investigation was as near completion as possible; and if the Gas Committee were to go into it, they would have to go over the same ground as the Investigation Committee had during the past year.

Mr. PHILLIPS seconded the motion.

Mr. R. JOHNSON suggested, as asking questions about the Investigation Committee seemed to have been the sole occupation of Mr. Jackson for the last twelve months, that his name should be added to the Committee.

Alderman SMITH expressed his willingness to add it.

Mr. JACKSON said that he did not know what had taken place in the Committee; and he would not now be put on to take their blame.

The MAYOR then read the following letter from the Town Clerk in reference to the Gas Investigation Committee:—"The old Committee, whose powers expired in November last, had before it the settlement of the outstanding accounts in respect of the new gas-works. They succeeded in making satisfactory arrangements with Messrs. Dempster and Sons for the gasholder, and with Messrs. R. and J. Dempster for the retort-roof; and both these accounts have been settled with the approval of the Council. There are, however, two other accounts still unsettled—namely, that of Mr. Winnard for the retort-house, and that of Messrs. Holme and King for the tank and boundary wall. Mr. Winnard's account has resolved itself into questions of measurement; whilst Messrs. Holme and King allege their account has been settled with the exception of the boundary wall, which they are willing to make satisfactory. It is for the purpose of settling these two accounts that the re-appointment of the Gas Investigation Committee is necessary."

Mr. JACKSON asked whether the Council could have any more information on the point.

Mr. RICHARDS said he had been on the Committee during the two years of its existence; and he might say the proceedings in Committee had been published every month, and Mr. Jackson was in possession of as much information as he (Mr. Richards) himself was. It had been suggested that Mr. Jackson should be on the Committee; and he (Mr. Richards) was quite willing to allow him to take his place.

Mr. STUART said he knew of nothing that had occurred, and nothing that might happen in the future, that could not be published in the Council. All that had been done in the past had been reported.

The resolution was then carried.

THE PROPOSED PURCHASE OF THE BRISTOL GAS AND WATER WORKS BY THE CORPORATION.

At the Meeting of the Bristol City Council last Tuesday—the MAYOR (Alderman Wathen) presiding,

Mr. WILLIAMS, in accordance with notice given (Vol. LII., p. 1036), moved—"That a Committee be appointed to consider and report as to the advisability of the Corporation acquiring the undertakings of the Bristol Gas Company and the Bristol Water-Works Company; and if it appears to such Committee that such undertakings, or either of them, should be so acquired, to endeavour to ascertain upon what terms such an acquisition can be effected." Everyone, he said, would admit that the water supply of the city should be under the entire control of the Town Council; and they would further admit that it would be an advantage if the gas-works could be obtained on fair and equitable terms. If the Directors of the Water Company were approached in a businesslike way, they would only ask a fair and reasonable price for their undertaking; and the same could be said of the Board of the gas-works.

Mr. PEARSON seconded the resolution, on the condition that the reference to the Gas Company should be struck out, and all the words following "Water-Works Company" omitted.

This modification having been accepted by Mr. Williams,

The MAYOR said the present was an exceedingly inopportune time to bring the matter forward; and he asked that it might be allowed to stand over for a time.

Alderman PROCTOR-BAKER spoke against the appointment of the Committee; believing that the time of the members would be entirely thrown away. Some years ago terms were arranged for the purchase of the water-works; but they were considered too onerous by the ratepayers, and the project was abandoned. The bargain then made would have been an extremely good one for the city—not perhaps financially speaking—because it would have placed the control of the water supply in the hands of the Council. He was convinced that it would be impossible for the city at the present time to pay the price the Company might reasonably ask, without involving the ratepayers in a very much larger cost than they ought to bear. Mr. Williams, he thought, would do well not to press his motion.

Alderman FOX, while agreeing with the desire that the water undertaking should be placed under the control of the Corporation, pointed out that on two occasions, if not more, when overtures had been made to the Company, the Council had been met with a curt refusal; and it seemed to him very undesirable to approach them again, unless they were conscious of a willingness on their part to treat. He also thought that, before embarking on any such enormous financial operation as this, they ought to have some comprehensive statement as to the exact financial position of the Corporation; for surely there was a limit per head of the population beyond which no Corporation should involve itself.

Mr. WILLIAMS consented to withdraw his motion; and the Council proceeded to other business.

THE ST. GEORGE'S VESTRY AND THE LAYING OF GAS-MAINS.—At the meeting of the Vestry of St. George's last Thursday, a letter was read from the Board of Trade, announcing that an appeal had been made by The Gaslight and Coke Company against the decision of the Vestry upon the Company's application for permission to lay a 6-inch main under the footway of Upper Grosvenor Street from Park Lane to Grosvenor House, to supply the kitchen with common gas for cooking purposes. The Committee of Works now recommended that the Vestry sanction the main being laid under the roadway at a depth of at least 4 feet; and, further, that the letter of the Board of Trade and the draft reply be referred to the Solicitors. This was agreed to.

BIRMINGHAM ELECTRIC LIGHTING SCHEME.—The Sub-Committee of the General Purposes Committee of the Birmingham Corporation which have this matter in hand, met last Thursday, and settled the recommendations on which their report to the General Purposes Committee will be founded. It is understood that several important amendments of the draft Provisional Order submitted by Messrs. Chamberlain and Hookham were agreed upon, affecting, amongst other things, the amount of capital required for the undertaking, and the formation of a Company. These and other points, it is believed, will be discussed with the promoters before the report is formally prepared, and possibly an agreement may be arrived at. The report will then be considered by the General Purposes Committee, and be presented to the Council at a special meeting convened for the purpose on Feb. 5.

PARA GAS COMPANY, LIMITED.

REPORT OF THE DIRECTORS.

The Directors of this Company, in their report for the half year ended Sept. 30, 1888, state that the total revenue for the half year is somewhat less than for the corresponding period of 1887; and that there is a small falling off in the profits on public and private lighting. The expenditure has been limited to that necessary to keep the Company's property in good order; and the works and plant are reported by the Manager to be in an efficient state. Carbonizing material has been more costly, on account of the increased price of coal and the higher rates of freight. Difficulty has been experienced in realizing coke and tar, notwithstanding the efforts of the Manager, by reduction in price and the adoption of other expedients, to bring them into more general use. Every exertion has been made to meet all the requirements of the Provincial Government. Gas of an illuminating power in excess of that called for by the concession has been regularly distributed, and every care taken to keep the public lighting in the best possible order. Nevertheless, "fines" have been imposed, which the Manager assures the Board are unjustifiable, and which he never ceases to protest against. They amount in the half year to the equivalent of £547 19s. 2d. (exclusive of exchange), or more than 9 per cent. on the total received. In the two reports issued last year, the Directors drew attention to the representations made to the Imperial Government, regarding fines, non-repayment of duties, and accounts in arrear. The speedy settlement anticipated with regard to duties, they regret to say has not been realized, notwithstanding continued reminders; and the question of the remission of fines is still unanswered. At the end of the half year, accounts were due for public lighting for November and December, 1887, as well as for May, June, July, and August of the current year, amounting to £7800, as compared with £7100 on Sept. 31, 1887. Debentures, carrying interest at 6. per cent., to the amount of £7700, fall due on the 31st inst. The Directors have arranged to repay £2800, and renew the balance—£4900—at 5 per cent. for a further period. It is mentioned that the new Manager (Mr. J. Gibson Newbigging) took charge of the works and property of the Company on May 7 last; and the Directors state that they have no reason to regret the appointment they have made. They believe Mr. Newbigging to be an efficient and conscientious Manager. The payment of dividends for the half year at the rate of 4 per cent. per annum upon the ordinary stock of the Company, free of income-tax, and at the rate of 7 per cent. per annum upon the preference shares, less income-tax is recommended by the Directors.

THE DUBLIN CORPORATION AND THE LIGHTING OF THE CITY.

At the Meeting of the Dublin Corporation on New Year's Day, the Right Hon. Thomas Sexton, M.P., was installed for the second time Mayor of the city; and in responding to a vote of thanks for his services to the citizens during the past year, made extended reference to the relations subsisting between the Corporation and the Gas Company, as well as to the projects of the Town Council with regard to electric lighting. He said: The important question of the lighting of the city, which has been for many years the cause of active and sometimes fierce contention, is, in my opinion, now in a transition state; and I think it not unlikely that the settlement of it in one sense or another may not be very remote. I notice with satisfaction a decrease of £1000 in the lighting estimate for this year. I am glad that our new Inspector—whom I am glad to have the opportunity of describing as an efficient and diligent officer—hopes to achieve the greater part of this reduction by more vigilant supervision. Such a reduction is to us a very new experience. You have not had the like of it for the last 15 years—not since the day when the talented gentleman who was then your Inspector of Public Lighting transferred his services to another employer. In the course of the six years of his tenure of office, he lowered your gas bill from £11,000 or £12,000 a year to only about £6000. Every year since your gas bill has gone up, until last year it reached a figure midway between £10,000 and £11,000. Whatever may be the cause of it—and it is not for me to determine, for I am not qualified to attempt it—it is for me to say, as an ordinary observer of public affairs, and a person of average intelligence, that this steady and continual increase has not been explained to the satisfaction of this Council or of the public. A decrease of £1000, however, is something that may cause us to have good hope. I trust it will be found that the hope excited by it will be realized in the course of the year. I wish to say that the Sub-Committee appointed lately by the Council to deal with the question of lighting have effected a useful reorganization of the staff of their department; and that they have diligently taken such practical steps as they considered likely to advance the purposes of the Council. I think, however, I may say frankly that the proposals—reasonable in their opinion—which they have made, have met so far, at the hands of the Gas Company, with nothing like encouragement. We have not succeeded in inducing the Company to provide what we consider to be proper appliances in the testing stations; nor have we succeeded in inducing them to put approved regulators upon the public lamps. We have not even succeeded in persuading them to consent to the removal of the testing station from a position which our Inspector considers to be inconvenient and almost useless to the city, to a site where we could test the gas in the several trunk mains of the city to our own satisfaction. We have not succeeded in inducing the Company to accept any sort of tolerable arrangement with regard to what we consider reasonable reductions in the amount of their accounts. All of these questions—or, at any rate some of them—will have to be brought soon to an issue; and while, for my own part, I should prefer a friendly settlement between an Irish Corporation and an Irish Company, I do not disguise from myself that it is better to resort to the means provided by the statutes for the determination of these disputes, than to allow them to hang on interminably for years, confusing the public mind, provoking the public temper, and leading to no open and clear decision. Concerning the projects of the Council with regard to electric lighting—and this is a subject which in my opinion will have a useful influence on the matter which I have just discussed—I wish to state that I learned a few days ago from Mr. Courtney Boyle that the Licence which you sought from the Board of Trade for public lighting is now practically settled; and that it may be expected presently to issue. With regard to the question of private lighting, you will bear in mind that the Gas Company last July gave us notice that they intended to ask for a Provisional Order for powers of electric lighting. The Council felt it necessary, in view of the fact of this application being about to be made by a trading Company, operating of course for profit, and which has enjoyed for many years in this city the monopoly of a necessary of life—namely, light—to prevent that Company from erecting a fresh monopoly for a further indefinite term; and they therefore determined themselves to apply for a Provisional Order. But the Gas Company, having first desired a conference with us at the Board of Trade, and having afterwards put the Board of Trade to the trouble of sending over an Inspector to Dublin, did not appear before him, but let their case go by default; and when the time came for taking action on their application for a Provisional Order, they took no steps whatever. Upon consideration of this new state of facts, the Council determined—and, I think, with evident reason—to proceed, not by way of Provisional Order, but by way of Licence. A Provisional Order requires parliamentary sanction; and if you were to proceed by Provisional Order, it is, I think, almost certain that you would have to face before the Committees of both Houses an opposition which would not be the less costly to you because it might be quite unreasonable. The Licence may be granted by the Board of Trade for a term of seven years. Seven years is long enough, if you have any practical intentions; and when the term of seven years is up, if you have used your powers, the Licence is renewed almost as a matter of course. The settled policy of the Board of Trade is to give the fullest facilities to the local authorities in respect of electric lighting; and therefore I conclude that a Licence for private lighting will be in your hands in the course of a few months, and that before the end of this year we shall be in a position, not only to light the streets that are defined in our application, but also to give the citizens an opportunity of showing how far they are prepared to sustain the Council in the work of applying electric light to the private lighting of the city.

From a letter which has been forwarded by the Secretary of the Alliance and Dublin Consumers' Gas Company (Mr. W. F. Cotton) to the Lord Mayor, Aldermen, &c., of the city, it appears that at a meeting of the Paving and Lighting Committee of the Corporation, on the 31st ult., the Inspector of Public Lighting reported that on Dec. 24, 25, 26, 28, and 29 the illuminating power of the gas supplied by the Company was under the prescribed standard. Mr. Cotton says that, if the Inspector be correct in his statement, the Company have incurred an additional liability to penalties payable to the Corporation amounting to £100, which can be recovered before the Divisional Magistrates of the city. The letter continues: "I have been again directed to ask that if your body has any confidence in the ability of their Inspector to take correct testings, proceedings shall be taken against this Company; so that the public may see whether the charge can be established or not. The expense of such proceedings before the Divisional Magistrates will be comparatively trivial; and the Corporation will be adopting the advice given by the Right Hon. the Lord Mayor, in his speech yesterday [the 1st inst.], when alluding to the differences between your body and this Company, in which he stated that 'it is better to resort to the means provided by the statutes for the determination of these disputes than to allow them to hang on interminably for years, confusing the public mind, provoking the public temper, and leading to no open and clear decision.'" The challenge contained in this letter was mentioned on the notice paper of business to come before the City Council at their meeting yesterday.

ROCHDALE CORPORATION GAS AND WATER SUPPLY.

THE PAST YEAR'S WORK.

In the course of a survey of local affairs in the past year, a Rochdale paper makes some allusion to the working of the Corporation Gas and Water Departments. Regarding the former, it says that the consumption of gas during the year has been but very slightly in excess of the previous one. This is no doubt partly due to the mild and open weather which was experienced up to the end of the year, and partly to the short time which prevailed in the cotton trade during the early part of the autumn. Possibly the further reduction in price, which came into operation at the beginning of the year, may stimulate consumption; and thus produce a respectable increase by the end of the financial year in March. Up to the 21st ult., the make of gas was 207,979,000 cubic feet—an increase of only 146,000 feet over the corresponding period of last year. The quantity of gas made during the week ending Dec. 21 was 11,936,000 feet; or 78,000 feet less than in the corresponding week in 1887. The heaviest consumption on any one day took place on Monday, Dec. 10, when 1,977,000 feet were sent out. On this occasion, after a bright clear morning, fog set in about 1.30 p.m., and continued all the afternoon; and as an example of the effect on the consumption of gas, it may be stated that, whereas during the morning the quantity sent out did not exceed 30,000 feet per hour, in the early part of the afternoon this ran up to 200,000 feet—the make of gas, of course, remaining the same (about 70,000 feet per hour). In the residual products department, there have been considerable alterations during the year—principally in the portion devoted to the production of sulphate of ammonia. The old part having become inadequate, and being also in need of extensive repairs, it was decided to discontinue it, and adopt newer and more economical apparatus. The new plant has now been working some three months; and the results, it is stated, are quite satisfactory, and realize all expectations. The tar plant also continues to work satisfactorily; and prices have improved somewhat in most of the products—that for pitch being specially prominent.

Concerning the Water Department, our contemporary remarks that 1887 will be long remembered as the time of the great drought. By the costly but efficient system of reservoirs Rochdale not only escaped the famine, but were able to go to the rescue of Heywood and many other places which had trusted to private sources for their water supply. All this, of course, swelled the receipts, with the result that that year's deficiency was £13,000 as against £14,500 in the previous twelve months. In the past year, although there was not this extraordinary income, it is understood that there was such a marked increase in the ordinary receipts that the next call on the ratepayers will not be larger than the last. By the end of the financial year, it is believed that at least 500 additional supplies will have been secured—nearly 200 more than last year. This, of course, means a permanent increase in the source of income. After the drought of 1887, the reservoirs filled splendidly. Large quantities of water have had to be allowed to run to waste; and at periods of the year when water is usually at its lowest, it was brimming over. In its previous retrospect, our contemporary anticipated the construction of filters and a service reservoir at Spring Mill, at a cost of about £2000. This was the Committee's intention; but Mr. Tomlinson, the Water Manager, tided over the difficulty without such a large and unwelcome expenditure, and the provision of the filters is indefinitely postponed. All the old and new reservoirs have been connected; and the town can be supplied from either one or the other. Spring Mill is ordinarily used; but should a storm or other cause disturb or discolour the water, then one of the other lodges is requisitioned, and in the meantime the former is refilling. The energies of Mr. Tomlinson and his staff are being directed to the very practical end of increasing receipts and lessening expenditure. That this has already been done to a considerable extent is obvious; for the deficiency, which has exceeded £16,000, is now down to £13,000. In September, the Council advanced Mr. Tomlinson's salary from £250 to £300. His management has certainly been more successful than was anticipated.

THE STOCKTON AND MIDDLESBROUGH WATER BOARD'S MANAGER.—At the meeting of the Stockton Town Council last Friday, the following resolution was, after a long discussion, negatived by 14 votes to 8:—"That, in the opinion of this Council, the increase from £650 to £850 per year salary given by the Water Board to their Manager in detrimental to the interests of the ratepayers."

TRADING BY CORPORATION COMMITTEES.

The members of the Birkenhead Town Council, at their monthly meeting last Wednesday, had rather an animated discussion on this subject which was originated by the presentation of the minutes of the Gas and Water Committee, which recommended that the tender of a local firm be accepted for the supply of compound double-valve six-gallon cisterns as required by the Water Department from time to time. Mr. Getley objected to the Water Committee supplying property-owners with these cisterns, instead of leaving them to obtain them from the tradesmen of the town in the ordinary course of business. The Committee also offered to do the work at cost price; but he maintained that the tradesmen could do the work better, and make a legitimate profit out of it, at a price below that which the Committee could do it at. He moved that the recommendation be referred back. This having been seconded by Mr. Hope, Mr. Lees observed that the matter had been brought before the Gas and Water Committee by the Health Committee, and the Committee were bound to carry it out. Mr. Laird did not think the Committee should go out of their way to compete with the tradesmen in the town, who, in his opinion, could do the work quite as satisfactorily and expeditiously. It was pointed out by Mr. Little that the Local Government Board had drawn the attention of the Committee to the fact that there were about 900 houses in the borough in which the water supply was in direct communication with the closet, and not conveyed through a cistern; and the Committee being anxious to meet the wishes of the Board, had a conference with the Health Committee, at which the alterations were agreed upon. It involved, he said, the alteration of 200 to 300 cisterns each year, for a period extending over two to three years; and the work was done as cheaply as it could be. In carrying it out, the Committee had to consider the interests of the property owners, as well as the residents. Mr. Delany contended that this work should be left to the tradesmen of the town, to whom the action of the Committee was a gross injustice. Mr. Shaw remarked that if the work was done by the Committee at cost price, with the cost of labour and establishment charges added, he could understand it; but if the latter were left out, then the Committee were putting themselves in direct competition with the tradesmen, who were quite able to do the work, and were willing to do it under the supervision of the Water Department's officers. He held that, only under exceptional circumstances, should the Corporation enter into competition with the tradesmen in work of this nature; and that the Gas and Water Committee should confine themselves to Corporation work, the same as the other Committees. Alderman Rawcliffe, the Chairman of the Committee, complained that no notice had been given him in reference to this matter, in which the Local Government authorities had insisted on action being taken. There was not the slightest disposition on the part of the Committee to compete with the tradesmen of the town; and what the Committee did was to supply these cisterns at cost price, and add 10 per cent. for labour. To refer the recommendation back would be to adopt a do-nothing policy. The amendment to refer the matter back was then put, and carried by 25 votes to 17.

THE ELECTRIC LIGHTING OF BARNET.

At the Meeting of the Barnet Local Board last Tuesday—Mr. T. Samuels in the chair—a letter was read from Mr. Joel complaining that the Board had treated him somewhat harshly, and stating that it was unfair for members of the Board who were shareholders of the Gas Company to oppose the electric lighting in the way they had done. A letter was also read from Mr. Joel's solicitor, asking the Board not to act on the resolution arrived at to determine the contract; for if Mr. Joel was allowed sufficient time, he would be able to light the district properly. The Chairman said it was now for the Board to decide whether they would determine the contract or continue it. Mr. James then raised a point of order—whether Mr. Schmidt, being interested in the contract as Mr. Joel's landlord, could bring forward the motion of which he had given notice. The Clerk said it was not for him to determine whether a member was or was not disqualified; but he would say that, in his opinion, Mr. Schmidt was not interested in the lighting contract. Mr. Schmidt then moved—"That the resolution passed by the Board on the 21st ult., to the effect that the electric lighting contract be terminated in accordance with notice given to the contractor be rescinded." He said that when the Board passed the resolution to adopt electric lighting, it was at a full Board; and it was done with a view to getting the best light for the town. But when it was resolved to terminate the contract, there were but six members present; and the resolution was passed at the beginning of the meeting. He would give three reasons why the resolution passed on Dec. 21 should be rescinded. The first was that, if the contract was terminated, it would be a serious drawback to the town; the second, that the resolution was a destructive resolution; and the third, that it was unconstitutional to treat the contractor in such a harsh manner. He then proceeded to argue that the light was satisfactory, and that the contractor was not to blame for the failures which had occurred, having regard to the difficulties which he had encountered. Mr. Walker seconded the resolution. Mr. James observed that he would be open to a charge of insincerity if he allowed the resolution to be rescinded without opposing it. Mr. Schmidt had remarked that the resolution was a destructive one; but he (Mr. James) would remind them that it was not passed until notice had been given to the contractor, which notice was determined on by a full Board. Mr. Schmidt had also stated that the idea was to get cheaper light. He believed Mr. Joel had said that he could light the town at 4s. per lamp less than gas; but the idea they started with and what they had experienced were totally different. It was not until Mr. Joel had gone from his first verbal statement to light the town with 16-candle power lamps, and refused to light it with any thing less than 32-candle power ones, that he (Mr. James) opposed the introduction of the light. They had now to pay nearly £50 more for the very miserable light they had; and, if the town was insufficiently lighted, he would ask, "Where comes the saving?" The Surveyor's reports had shown that the lighting was a failure. Mr. Joel and Mr. Marriott stated before the contract was entered into that the installation could be put down within a fortnight; and if notice after a four months' trial was arbitrary, he did not understand the term. All the Board ought to consider in the matter was, Had the contractor reasonably carried out his contract? As a public body, they had no right to consider Mr. Joel's ability either financially or otherwise. If he was not able to carry out his contract, he had no business to sign it, and had no right to come and experiment in their town. The contract bound him to light the town by Sept. 1; and he was not to avail himself of overhead wires for a lengthened period. Another point of failure was that the junction lamps had not been kept lighted, notwithstanding that the new engine had arrived, and had been at work for some days. He (Mr. James) was therefore obliged to say that the contractor had not properly carried out his contract. Other members having briefly supported Mr. Schmidt's motion, the Chairman said he thought the resolution of Dec. 21 was passed hastily, and without due consideration. He was sure the time was not far distant when the light would be satisfactory. The motion was carried.

ELECTRIC LIGHTING SCHEMES FOR THE METROPOLIS.

The Board of Trade and the Granting of Licences.

In several of last Wednesday's daily papers, a paragraph appeared which stated that the Board of Trade, by virtue of the powers vested in them by the Electric Lighting Act, of 1882, have decided to refuse the whole of the applications that have been made to them to grant Licences for the supply of the electric light to any part of the Metropolis. The effect of this decision is that all applications for supplying the electric light to any part of the Metropolis will have to be sought by means of Provisional Orders, which, if granted by the Board of Trade, must receive the sanction of Parliament before they can become operative. All Provisional Orders granted will, therefore, be embodied in a Confirmation Bill, and referred to a Select Committee, before whom opponents will be heard.

Alluding to this paragraph, Mr. Robert Hammond, on the same day, addressed the following letter to the Editor of *The Times*:—Sir,—With reference to the statements in to-day's newspapers to the effect that the Board of Trade, in virtue of the powers vested in them by the Electric Lighting Acts, have decided to grant no Licences in the Metropolitan area, I beg to call your attention to the following correspondence with the Board of Trade on the subject:—

Dec. 28, 1888.

Sir,—I beg to hand you herewith a report of the proceedings at the general meeting of the London Electric Supply Corporation, Limited, and to draw your attention to a statement of the Chairman therein contained that, "within the last fortnight, the Board of Trade have decided not to grant Licences to anybody in the Metropolis." I should esteem it a favour if you would kindly inform us whether any action has been taken by the Board of Trade justifying this announcement.—I am, Sir, your obedient servant,

Robert Hammond.

H. G. Calcraft, Esq., C.B., Secretary to the Board of Trade.

Board of Trade, London, Dec. 29, 1888.

Sir,—I am directed by the Board of Trade to acknowledge the receipt of your letter of the 28th inst., inquiring whether any action has been taken by this Department to justify the announcement that the Board of Trade has decided not to grant Licences to anybody in the Metropolis.

In reply, I am to state that the only decision at which the Board of Trade have arrived, with respect to applications for Licences in the Metropolis, is that announced in the letters addressed by this Department to the London Electric Supply Corporation, Limited, and the Metropolitan Electric Supply Company, Limited. From these it will be seen that the only decision that the Board of Trade has come to is not to grant Licences to companies for extensive and important areas in the Metropolis.—I am, Sir, your obedient servant,

Henry G. Calcraft.

R. Hammond, Esq., 117, Bishopsgate Street Within, E.C.

From this announcement it will appear that the statement published in the Press is incorrect, and that the Board of Trade is actuated to-day by the same policy as that which it enunciated in its letter of the 17th of August, 1883—*i.e.*, that a Licence is the form of tenure under the Electric Lighting Act properly applicable to small areas; whereas large areas can only be properly dealt with by means of Provisional Orders. The question, therefore, which the Board of Trade and the local authorities have now to decide is whether the time has arrived when, in the public interest, the Metropolis shall be dealt with by the allotment of large areas to certain electric light companies under a 42 years' tenure, or whether it would not be a more prudent course, in the present state of the industry, to insist that those companies that are applying for this permanent form of privilege should, in lieu thereof, be granted Licences for a short number of years and for limited areas, in order that the merit of their pretensions may be tested by a probational period of working. As one who has taken from the beginning an active part in the development of the industry of house-to-house lighting by electricity, I take this opportunity of stating some of the grounds upon which it may be advisable for the local authorities and the Board of Trade to grant Licences for limited periods and for limited areas in the Metropolis, in preference to Provisional Orders giving a 42 years' tenure:—(1) No district lighting has up to the present time been carried out in the Metropolis of so satisfactory a nature as to warrant the Board of Trade and the local authorities in proceeding at once to the apportionment of the Metropolitan area by means of Provisional Orders; and no district lighting whatever has been carried out over an extended area by means of underground mains—the mode of distribution contemplated by the Act. (2) It would be very prejudicial to the interests of the public to be served by electric light companies who were unable to thoroughly carry out the work; and until the new crop of electric light companies in the field have proved by natural selection which is the fittest, no 42 years' tenure in the Metropolis should be granted at all. (3) It is urged by many that the electric lighting of the Metropolis has been sufficiently long delayed, and that if it be still further delayed, in order to discover which are the best supply companies, the interests of the consumers will suffer; but the fact is that the work carried out under Licences—say, within the first twelve months—will be quite as extensive as that which would be carried out in the same period under Provisional Orders. (4) Under the provisions of the Electric Lighting Acts, the companies intending to apply for Provisional Orders have to give notice of their intention to do so prior to the 1st of July in each year; and it happens that only two companies had the temerity in June last to apply for the Metropolis *en bloc*, and the immediate apportionment of the Metropolitan area by means of Provisional Orders would practically lead to that area being handed over to these two companies, irrespective of whatever knowledge and experience may be available for the public at the hands of those companies which such an apportionment would exclude. (5) If in any form the electric lighting of the Metropolis is to become the province of the new County Council, it would be as well that, until that body gets to work, no action on the part of the Board of Trade or the local authorities should tie its hands, by granting extended privileges to so limited a number of supply companies as that indicated above. There are many other considerations of a technical nature which I refrain from touching upon, as I feel that I have already sufficiently trespassed upon your valuable space; but I may mention, in conclusion, that so little is apparently known in England as to the erection of central electric lighting stations, that one of the two companies seeking for powers in the Metropolis has actually given out the order for the erection of its first station to an American firm, though, from a recent visit which I personally made to America, I am disposed to agree with those English electrical engineers who believe that there is no reason why, with the splendid apparatus now being manufactured in England, first-class work cannot be done by English firms. The strong plea that I set forth in this letter is that time should be given to prove which is the best supply company or companies in the field before giving permanent tenure to any.

The Nelson Local Board Gas Committee have decided to recommend the Board to advance the salary of Mr. William Foster, the Gas Manager, by £50 per annum.

The offices of the Stroud Gas Company were broken into last Friday night week, and about £40 stolen. Two men have been charged on suspicion with the burglary.

OVERHEAD ELECTRIC LIGHT AND OTHER WIRES IN NEW YORK AND BIRMINGHAM.

Some particulars as to the extent of the trouble already experienced by residents in New York, consequent on the great extension of electric light and other wires in the city—both overhead and underground—were given in a paper read at the recent meeting of the National Electric Light Association by Dr. Schuyler S. Wheeler, Electrician of the Board of Electrical Control. He says: The total number of miles of underground wires already laid in New York is 3697; in Brooklyn, 2100; in Paris, 4100; in Chicago, 200; in Boston, 400; and in Pittsburg, about 1000. There are at present underground, in the City of New York, more electrical conductors than in any other city in the world (except Paris); while the capacity of the subway construction already finished in this city may be estimated fairly at something over 30,000 miles of conductors. There are through lines completed from the Battery to the Park on the two principal thoroughfares of the city—Broadway and Sixth Avenue; and a gradual conversion of overhead lines to underground lines in the busy parts of the city may be confidently expected. The Board of Electrical Control is not unmindful, however, of the magnitude of the labour and expense required in converting the present arrangements into underground systems; and does not contemplate either the hampering of the business of electrical companies by forcing unreasonable numbers of wires underground, or by attempting to compel the use of subways faster than is consistent with the efficiency of the various electrical services to the public. If the great mass of overhead conductors are removed, and the remainder of the services brought to a condition which will insure the safety of the public, and at the same time the benefit of the companies themselves, it will be the result desired by the people of the city, and which the Board of Electrical Control is endeavouring to attain. As to this matter of regulating the overhead service in the city, I may say that an investigation of all the wires overhead, instituted since I have been connected with the work of the authorities in charge of electrical matters here (by the inspectors appointed after a rigid examination, and found competent for the purpose), has shown that a great deal of very bad and unnecessarily dangerous work has been done in New York, and that a reprehensible and inexcusable condition of overhead wires is the principal, if not the only, cause of the clamour for underground services. In addition to this, an enormous quantity of wires, and a large number of poles, not in use at all exist; amounting, as has been variously estimated, to from one-half to two-thirds of all the wires and poles in the city. One has no idea of the aërial freebooting that is, and always has been going on with overhead wires, until he spends some time seeing what there is overhead. The condition of wires in the city is simply outrageous. The companies owning wires will not permit each other to make common use of the poles; but will, without notice, chop off wires owned by others. The telephone people object to the electric light wires on account of the induction. Where there is a line of light wires on their side of the street passing close to their poles, they will not allow them to be made fast. The result of the necessity thus made for extra poles is sometimes four lines of poles on one side of the street. Hence most of the wires swing close to, or against the other poles to which they are not attached; and linemen, in climbing them, have to crawl through all the other wires which are not fastened to cross-arms. Among the cases of dangerous wires and unnecessary obstructions found by the inspectors are full lines of large poles extending over miles of streets, filled with wires which are "open" and out of use, but left standing to save the expense of removal; long lines of poles left standing to preserve right of way; arc-light day circuits within reach and with the insulation dropping off; and bunches of dead wires hanging from house tops, &c.

The question of overhead electric light wires has recently been engaging attention in Birmingham, consequent on the application of Messrs. Chamberlain and Hookham for a Provisional Order, to empower them to light an area of about 0·203 square miles, or 130 acres. The General Purposes Committee of the Corporation appointed a Sub-Committee to consider the provisions of the proposed Order; and it is expected that they will report in time for the matter to be debated at the next meeting of the Council. It may be mentioned in passing that the subject of electric lighting was generally discussed by the Council in 1882, upon the original application of the Crompton-Winfield Company. In a report, which received formal and unanimous approval, the Gas Committee expressed their view as follows:—"It must be remembered that it is desirable to place the supply of electricity as early as possible under parliamentary control. Overhead wires for private supplies, which are known to be a source of public danger, are already being fixed in Birmingham; and it appears to the Committee that this is a matter which should receive the early attention of the Council." The "early attention" has been somewhat long in coming. On the whole, it is believed, the present report will not be unfavourable to the scheme; but a number of conditions, in the interests of the ratepayers and of the public safety will be imposed—the most important being in reference to this question of overhead wires. One of the local papers has lately dealt with this matter at some length; and it points out that there is a general concensus of opinion among experts that overhead wires, for whatever purpose, are more or less objectionable. Our contemporary views the subject from two standpoints—the jeopardy in which the public may be placed by conducting wires overhead; and the danger which there is, by prohibiting wires being placed above ground, of greatly handicapping electrical enterprise, if not of stopping it altogether. As to the first point, it says that the case has already been made public; and then the writer goes on to enquire whether overhead wires are so dangerous as to justify the alarm which has been raised. He first quotes the following recommendation from a report to the Sub-Committee referred to above which has been prepared by Mr. Henry Lea, of the firm of Messrs. Lea and Thornbury, Consulting Engineers:—"Overhead electric lines not to be employed within the borough of Birmingham, excepting with the special consent of the Local Authority, and then only for a short period—say, for two years in each case, in which it may be desired to use them. They are to be employed only as pioneers for ascertaining the extent of the demand in new districts prior to laying down electric lines permanently underground. The approval of the local authority to be necessary as to the method and details of construction and insulation of all overhead wires before they are proceeded with." "In the opinion of this expert," the article continues, "overhead wires are not such a terrible menace to the public safety that they must be peremptorily tabooed, at the risk of keeping back for a long time the benefits of an extended system of electric lighting. Mr. Lea's recommendation indicates a compromise which the lighting companies would probably be quite willing to accept; but it is only fair to them to state that some electrical experts emphatically deny that overhead wires (provided always they are properly erected) are a source of appreciable insecurity to the public. Unsightly they must always be, and in some respects inconvenient; but they need not, it is maintained, be more dangerous than telephone or telegraphic wires." The United States, London, Brighton, Eastbourne, and Taunton are referred to as places where electric lighting wires have been fixed overhead "extensively;" and yet, it is remarked, accidents such as have been forecast for Birmingham have been practically *nil*. The conclusions of the Special Committee of the House of Commons which met in 1885 to consider the whole subject of electric lighting are cited; and our contemporary concludes by saying:—"Of course, all that is said about inconvenience to the Electric Lighting Companies would go for nothing, if the danger from overhead wires were as grave and pressing as the alarmists make out; but the evidence does not satisfy us that it is. On the contrary, the risk seems to have been exaggerated; and the public may therefore await with comparative equanimity the probable decision of the Committee in favour of the use of overhead wires for purely pioneer and experimental purposes."

On Friday, a letter appeared in the *Birmingham Gazette*, signed "T. C. Sharp, C.E.," referring to the article mentioned in the foregoing paragraph, in which it was averred that the alarmists who contend that overhead wires for the transmission of electrical current for lighting purposes are more dangerous than those used for telegraphic or telephone uses, have not the slightest ground for their presumptions. The letter continues: "The current conducted by these wires is not of sufficient volume to destroy human life, even if the wires were not protected; whereas in all cases which have come under my notice such wires have been properly insulated. At the experiments made in New York about a fortnight ago, a mare and two calves were killed by the main current of an alternating machine at 770 volts; and the wire with the halter weighed 1230 lbs. The current proposed to be used in America for electrical executions is 1200 volts whereas the maximum current carried by the overhead wires used in this country for electrical lighting purposes is from 100 to 115 volts." Underground wires, the writer thinks, will be the most compact and convenient when the electric light has become general; but the expense at present would quite check the progress of the system.

THE QUALITY OF SALFORD GAS.—The illuminating power and purity of the gas supplied by the Salford Corporation have, as our readers are aware, been the subject of considerable criticism. Tests were recently made, with a view to determine the illuminating power; a frequent complaint being that there was a serious deterioration in the quality between the works and consumers' burners in remote parts of the district. The experiments show with tolerable accuracy that the illuminating power is certainly not diminished by transmission so far; but rather improved, if the testing apparatus available is to be relied on. The extended tests, 37 in number, were taken daily from Nov. 28 to Dec. 10 simultaneously at the Bloom Street and Regent Road works, Broughton Town Hall, and the Eccles gas offices, at 10 a.m., 3 p.m., and 7 p.m. The works' tests were made by a Bunsen bar photometer; the tests outside being made with a Lowe's jet photometer. After due correction, the result was an average at each place as follows:—

Bloom Street works	19·06 candles.
Regent Road works.	19·27 "
Broughton Town Hall	19·42 "
Eccles Gas Offices	19·84 "

With regard to the purity of the gas, it is stated that the Committee have had the enlargement and improvement of the purifying apparatus before them for a considerable time; and they are determined to deal with the question immediately in the most thorough manner. Their action has, we learn, been only deferred so as to secure for their consideration the results of certain experiments in progress in another important gas-works.

THE VENTILATION OF THE VYRNWY AQUEDUCT ACROSS THE MERSEY.—A notice has been published in the *London Gazette* stating that, pursuant to the 9th section of the Act 5 and 6 Vict., cap. 110 (intituled "an Act for better preserving the navigation of the River Mersey"), the Conservators of the river have received from Mr. George J. Atkinson, Town Clerk of Liverpool, a notice of the intention of the Corporation to construct two ventilation shafts in connection with the Vyrnwy aqueduct, now being formed under the bed of the Mersey; the shafts to be placed within the tidal limits under the jurisdiction of the Conservancy. The notice referred to is addressed to the Acting Conservator of the river Mersey and to the Clerks of the Peace for the Counties Palatine of Lancaster and Chester, and for the City of Liverpool respectively. It states that "The Mayor, Aldermen, and Citizens of the City of Liverpool being the persons by the Liverpool Corporation Water-Works Act, 1880, authorized to construct the water-works therein described, do hereby give you notice that, at the expiration of two calendar months after the delivery of this notice, they propose to erect upon the line of the Vyrnwy aqueduct, authorized by the said Act, two ventilating shafts within the tidal limits, each such shaft being 4 ft. 2 in. square at the base, and not exceeding 15 feet in height above the surface of the ground, consisting for the most part of cast iron, and provided with a manway above the level of high water. The base of the more northern of such two ventilating shafts will be at a level of about 17·3 feet above Ordnance Datum; and the base of the more southern of such shafts will be at a level of 18 feet above Ordnance Datum. The object of the ventilating shafts will be to ventilate the tunnel or tunnels, and shaft now being constructed for the purpose of carrying the aqueduct across the Mersey."

HEYWOOD CORPORATION WATER SUPPLY.—At a recent meeting of the Heywood Town Council, in moving the confirmation of the minutes of the Water Committee, which contained a resolution agreeing to purchase the Far Knowl Farm, Naden, for £1300, Mr. Buckley said nearly all the members of the Council would remember the time when they found that it was unnecessary to go on with the Ashworth Moor scheme, and that they had still some water in the Naden Valley which they could impound. Considering that they had the plant at Clay Lane, it was thought that the best plan would be to raise the embankment of the middle reservoir. They still believed this would be the most economical way of doing business. After the Committee had agreed to raise the embankment, they found they had no land on the west side of the reservoir, and that they would have to purchase some 8 or 10 acres, in order to carry out the extension of the reservoir. They approached the owners of the land—the Trustees of Queen Anne's Bounty—and found it would cost nearly as much to purchase the portion which they required as it would the whole of the farm. After some discussion, the minutes were approved. On Thursday, the 29th ult., the members of the Council visited the new water reservoir at Clay Lane and found it full to overflowing. The Engineer reported that it had been full for about a week, and that careful tests had been made which had proved that it was absolutely water-tight. The reservoir is now finished, with the exception of fixing the valve gearing. The members afterwards visited Naden, to inspect the works in connection with the enlargement of the middle reservoir there; but owing to the inclement weather a complete examination could not be made. The work has been considerably advanced. With the exception of the middle reservoir which is only about 1 ft. 6 in. below the top level, all the reservoirs of the Corporation were found to be full; and the inflow very large.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, *Saturday.*

The Dundee Gas Commission are making slow progress with the redemption of annuities. It was reported by Treasurer Nichol, who presided at a meeting of the Commission on Wednesday, that three annuities—amounting together to £23 18s.—had been redeemed for £717. For an annuity of £11 10s., £345 had been paid; for another of £9 16s., £294 had been paid; and for a third of £2 12s., £78 had been paid. In the course of the last financial year, the Commission only redeemed three annuities. These were for £42; and £1193, or nearly 29 years' purchase, was paid for them. The present purchases have been at the rate of 30 years. Mr. Nichol went on to say that, although they were paying at the rate of £3 6s. 8d. per cent. for the annuities, and could borrow money at 3 per cent., he thought they acted wisely in redeeming them. The Commission have, since 1868, when they acquired the undertaking, redeemed annuities to the amount of £23,192, out of a total of £216,563; leaving £193,371 still to redeem. Towards this end, the Commissioners have in hand a balance of £20,905 in the sinking fund; and but for the long price which the annuities command, there would doubtless be a more rapid acquisition of them. The value of Dundee Gas Stock is seen in the circumstance that it now sells at £301 per £100, as compared with £272 in January last.

At the same meeting of the Dundee Gas Commission, several items of business of general interest were transacted. It was resolved to register the works under the Alkali Act, so as to admit of the manufacture of sulphate of ammonia, and the treatment of other secondary products. The very gratifying information was given that from the 30th of April to date there had been an increased consumption of gas, as compared with the corresponding period in the previous year, to the amount of 14,411,600 cubic feet. I may here remark that it has been reported that the largest quantity of gas ever sent out from the works on one day was on the 31st ult., when the total of 2,740,000 cubic feet was reached.

The largest output of gas in the present season from the Edinburgh Gas-Works was on Thursday, the 20th ult.—a dull, dark day—when the record was 4,558,000 cubic feet. As compared with the corresponding day of last year, this shows an increase of 228,000 cubic feet. The output on the 31st ult. was 4,458,000 cubic feet—an increase over the corresponding day of 1887 of 846,000 cubic feet. In Leith, the largest output was on Saturday, the 22nd ult., when 2,124,000 cubic feet were registered. The highest day's consumption in 1887 was on Dec. 27—2,075,000 cubic feet. These figures show a very satisfactory growth of gas consumption in the district.

The town of Broughty Ferry was thrown into darkness at seven o'clock on Tuesday night, by a failure in the gas supply. Over the greater part of the town there was total darkness for about ten minutes; and in the upper districts, the lights went down to a very small flame. The mishap is attributed to the pipe between two governors getting sealed with water. The Gas Manager (Mr. Myers) was at hand; and he was soon able to remedy the defect.

The question of improved street lighting is under consideration at present in Edinburgh, Leith, and Dundee. In Edinburgh and Leith the public lamps are being fitted with Peebles's governor burners of various sizes; and in Dundee it has been resolved by the Lighting Committee of the Police Commission, to fit up larger lamps in the High Street, to be furnished with burners consuming 5 cubic feet of gas per hour. The present burners consume 3 cubic feet per hour. These lamps are being put up experimentally, with a view to the general improvement of the public lighting. It has also been decided to furnish the lamps in other parts of the city with larger burners.

The town of Tayport, on the opposite side of the Firth of Tay from Dundee, is likely to be supplied with water by the Dundee Water Commissioners. Newport, which adjoins it, is already supplied by means of a steel water-pipe, which crosses the Firth on the Tay Bridge; and the supply to Tayport will be also through this pipe. The place was only last year created a police burgh; and the authorities, in the short time they have been in existence, have shown commendable activity in getting things into shape. At a meeting of the Dundee Water Commission on Thursday, it was reported that the assessable rental of the burgh of Tayport was £5790, and the total estimated revenue £436. It was calculated that the annual cost, including maintenance and management, would be £240, which would leave £196 of free revenue—not a great deal to cover the capital outlay on works (estimated at £3478), and to form a sinking fund. Bailie M'Culloch said that if it were a question of profit or no profit, he would be averse to the scheme; but they were required by their Act of Parliament to supply Tayport with water, if proprietors or tenants asked for it, and undertook to pay such rates for ten years as would return 10 per cent. on the cost of the works required. The terms they offered, he thought, were the most favourable they could make. The proposed supply will be at the rate of 15 gallons per head per day to a population of 3000. The Water Commissioners agreed to offer water on the above terms.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, *Saturday.*

The leading local event of the past week in connection with gas matters has been the discussion in the Glasgow Town Council, on Thursday, on the proposal to take a sum of £3000 from the gas surplus profits of the past year for Corporation purposes. There was also brought up the question of a large vote from the same funds directly for parliamentary expenses during the years 1885-6 and 1886-7. A stiff fight took place at the meeting referred to; and, as reported elsewhere, the vote went by a large majority in favour of drawing upon the gas profits for other than the purposes of the gas supply undertaking. These surplus profits seem to be regarded by some members of the Town Council as a sort of "milch cow" which should always be ready to be fallen back upon for a bit of draining, when other Corporation funds become severely reduced by financial mismanagement, or by spendthrift dealings with them. I am told that there is another demand about to be made upon the gas profits, as the quota the Gas Trust ought to contribute to pay the parliamentary expenses incurred on behalf of the Corporation for the year 1887-8.

It is reported that Messrs. Laidlaw, Sons, and Caine, of the Barrowfield Iron-Works, Glasgow, have secured the contract to supply to the Glasgow Corporation Gas Commissioners the two sets of large purifiers required for the Tradeston Gas-Works, which are now about to be reconstructed and extended. These purifiers are each to be 35 feet square, by 6 feet deep, and are to be arranged in two groups of four each, worked by two 20-inch hydraulic centre-valves. These will be provided with wrought-iron covers, to be worked by hydraulic lifting apparatus. The contract also includes the columns, and the girders and roofing required for the purifier and meter houses, which are to be in juxtaposition. I understand that the amount of the accepted tender was well nigh £9000.

Since dispatching my "Notes" three weeks ago, there have been some very large daily deliveries of gas from the three works belonging to the Glasgow Corporation Gas Commissioners. I have already mentioned that on Monday, Dec. 10, the consumption of gas was 16,071,000 cubic feet, and that on the following Friday, Dec. 14, the "record was beaten," inasmuch as that day's consumption amounted to 16,447,000 feet, as compared with 16,287,000 feet—the biggest total delivery in any previous year—on Dec. 21, 1887. Again the "record" has been broken; for on Thursday, Dec. 20, the total consumption mounted up to 16,811,000 feet. There have thus been three 24-hour periods over which the consumption of gas has been upwards of 16,000,000 cubic feet, in addition to which there has also been sixteen working days on which it has been between 15,000,000 and 16,000,000 cubic feet—five of them being 15,688,000 feet, 15,718,000 feet, 15,740,000 feet, 15,760,000 feet, and 15,948,000 feet. In connection with these statistics, I may mention that the consumption of gas over the whole of the month of December reached 440,098,000 cubic feet; whereas for the whole of the corresponding month of last year the deliveries did not exceed 420,316,000 feet; and in December, 1886, 408,539,000 feet. Taking the yield of gas per ton of coal at 9750 cubic feet, the amount of coal carbonized daily has averaged rather more than 1470 tons; the total amount on Dec. 20 being, at the same rate, fully 1730 tons. On two recent occasions the illuminating power of the gas has reached 24·7 standard candles and 24·88 candles. Latterly there has been 1740 retorts in use at the three works.

At the last meeting of the Dumfries and District Plumbers' and Gasfitters' Mutual Improvement Association, Mr. D. Kerr, of the Corporation Gas-Works, delivered an interesting and instructive lecture on "Gas-Meters." He briefly described the primitive forms of meters, with the chief improvements effected from time to time—making mention of the circumstance that a new and more efficient form of wet meter was invented by Mr. John Malam, great-grand-uncle of the present Engineer of the Dumfries Gas-Works. This meter was adopted in the year 1818 by Messrs. Clegg and Crosley—the firm chiefly associated at that time with the progress of invention in connection with gas-meters. Mr. Kerr informed his audience that the same gentleman also patented two dry meters. The principle of the "Defries" and other later meters was also explained by the lecturer, whose remarks were made specially interesting by the display of a number of exhibits which he had procured for the benefit of the members. These included a specimen of the original dry gas-meter; an improved dry meter, having glass panels through which the working of the different parts could be observed; and wet meters of different patterns. Mr. Kerr explained the practical working of these meters. He also instructed his audience how to avoid an explosion when gas is leaking at the meter; showed how a light could be applied to a meter or other vessel containing gas, even where there was a leakage, without causing an explosion; and described the proper method of reading the index of this much-abused instrument. A hearty vote of thanks was awarded to Mr. Kerr for his instructive lecture.

It seems that the Watching and Lighting Committee of the Glasgow Town Council are paying their lamplighters only 3s. 6d. per week, which is a most miserable pittance for the work they do and for exposing themselves to the weather at unseasonable hours. When the question was recently under consideration, one member of the Council is said to have made the startling statement that "the men are well enough paid for the work they do, seeing so many applicants are waiting on their situations." I hope it is not the case that such paupers' pay is being doled out to the men in question.

The principal features in the proceedings of the Glasgow pig-iron market during the past couple of weeks has been the publication of the official returns regarding the makes, stocks, and shipments of pig iron for 1888. In every respect the figures were considered to be satisfactory. There was not such a large increase in the makers' stocks as some persons had expected, considering the small quantity of makers' iron taken by the United States. Prices have fluctuated to some extent since the returns were published, and yesterday as low as 41s. 5d. cash was accepted for Scotch warrants, 33s. 8d. for Cleveland, and 44s. 6d. for hematite iron—all cases showing a decline on the day, of 1½d. per ton.

Owing to the occurrence of the annual holidays, the local coal trade has been without any marked feature for some days. Prices, however, remain firm.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Jan. 5.*

Sulphate of Ammonia.—The market maintains its firm attitude; and there has been a further slight advance. To-day £12 10s. is again quoted f.o.b. Hull; and Liverpool and Leith parcels can probably be secured at 2s. 6d. less. Nitrate is firmer, in consequence of the December shipments being about 15,000 tons below the estimate. But there is not much passing; and business in any of the manure materials can hardly be said to be yet in full swing. There are several large inquiries for sulphate, principally for French account; but the limits are somewhat below present values, and dealers do not seem very anxious to take the orders on the chance of lowering prices. There is remarkably little offering for the time of the year; and there is apparently a large portion of the production in second hands, upon the manner of the disposal of which the immediate future of the market seems to depend.

LONDON, *Jan. 5*

Tar Products.—There has been a fairly satisfactory amount of business doing in all the products excepting anthracene, which is at the moment unsaleable. Buyers, having made up their minds to the much higher freights demanded, are shipping pitch freely; and owing to the local consumption of this article stocks are low, and the price is looking up. Prices may be taken as follows:—Tar, according to position, 18s. to 24s. per ton. Benzole, 90 per cent., 3s. 1d. per gallon; 50 per cent., 2s. 5d. Toluol, 1s. 6d. per gallon. Solvent naphtha, 1s. 3d. per gallon. Crude naphtha, 30 per cent., 1s. 2d. per gallon. Light oil, 3d. per gallon. Creosote, 2¾d. per gallon. Pitch, 18s. 6d. to 21s. 6d. per ton. Carbolic acid (crude), 3s. 10d. per gallon. Cresylic acid, 10½d. per gallon. Tar salts, 15s. per ton. Anthracene, 30 per cent., "A" quality, 1s. 4½d. per unit; "B" quality, 1s. 2½d.

Ammonia Products.—Sulphate is again stronger; and price is distinctly better than last week. A large business is doing. Prices:—Gas liquor (5° Twaddel), 8s. per ton, with a rise or fall of 1s. 6d. per degree. Sulphate of ammonia, £12 5s. to £12 10s. per ton, less discount. Liquor ammonia, 2d. per lb. Carbonate of ammonia, 3¾d. per lb. Muriate of ammonia, brown, £20 per ton; white, £26 10s. Sal-ammoniac, £32 per ton.

THE PROPOSED WATER BILL OF THE BARROW CORPORATION.—The result of the poll for the purpose of ascertaining the feeling of the ratepayers with respect to the promotion of a Bill in Parliament by the Barrow Corporation for obtaining a water supply from the River Duddon, was declared on Saturday week, when 2509 voted in favour of, and 2216 against it. It is computed that the scheme will cost £60,000.

SUGGESTED ELECTRIC LIGHTING OF DERBY.—At the meeting of the Derby Town Council on Wednesday, the Mayor (Mr. Woodiwiss) mentioned that he had recently received communications from electricians submitting proposals for lighting the streets. He thought it would be best to refer the matter to the Parliamentary Committee for consideration, and moved accordingly. A brief discussion ensued, in which some members expressed the hope that the question would be fully looked into, and others were altogether hostile to the proposal, and objected to expense being incurred. In the end, the motion was approved, with the addition to the Committee of the names of the Chairmen of the Improvement and Construction and Plant and Stores Committees.

SERIOUS ASSAULT UPON A GAS-WORKS FOREMAN.—At the Hammersmith Police Court last Wednesday, Henry J. Walker, an assistant engine driver at the Fulham works of The Gaslight and Coke Company, was summoned for assaulting Mr. J. Chell, the foreman of the machinery department. From the evidence, it appeared that just before midnight on the 29th ult., the complainant received a message which led him to go into the engine-room, where he saw the defendant, who was drunk. He told him to put his things on and go home, and mind he did not find himself in the "lay-by" (a place for barges). The defendant came forward, and struck him on the forehead. He slipped; and while in the act of getting up, the defendant gave him three or four blows with his fist in the face, and afterwards struck him again on the forehead and face. The defendant said the complainant told him to get out of the place, and threatened to throw him into the "lay-by." What he did was in self-defence. It transpired that the defendant had been in the service of the Company from his youth; and Mr. Paget, taking this into consideration, said he would not send him to prison, but he felt bound to impose a heavy fine, as he did not know a more dangerous place for an assault to be committed than in an engine-room while the machinery was in motion. The defendant was fined £5, or one month's imprisonment.

A NARROW ESCAPE FROM SUFFOCATION BY GAS.—Last Sunday morning, Mr. G. Headworth and his family, who live at 73, Canada Street, Sheffield, narrowly escaped suffocation by gas. When the house was closed on Saturday night, nothing usual was noticed; but when Mr. Headworth awoke about six o'clock on Sunday morning, he found his wife ill; and on entering his children's bedroom, he was alarmed to find them suffering similarly to Mrs. Headworth. He went for a doctor; but had not proceeded far when he fortunately met two police constables. Hearing from Mr. Headworth that his wife and children were ill, they hastened to the house; and on entering it noticed a strong smell of gas. The officers found one of the children quite unconscious; and the other rapidly drifting into the same state. They carried the little ones down stairs into the street, and then—as instructed in their ambulance classes—applied artificial respiration. In a few minutes, signs of returning consciousness began to manifest themselves; and by the time the doctor arrived, he was able to declare the little ones quite out of danger. On an examination of the premises, it was found that the escape of gas was caused by the service-pipe having become, from some unknown cause, fractured. There is reason to believe that, but for the prompt and skilful action of the two police officers, at least one, if not all the three children would have been beyond recovery when medical aid arrived.

BURY CORPORATION IMPROVEMENT BILL.—The Bury Corporation are likely to meet with some trouble from the out-townships in regard to the water powers sought in the Improvement Bill which they intend promoting in the next session of Parliament. At the last meeting of the Little Lever Board, the Clerk (Mr. J. B. Goulburn) said that two or three years ago the Board undertook, in conjunction with other authorities, to oppose the Bury Corporation when they were seeking to obtain powers to raise the price of the water they supplied. That opposition was successful; but the Corporation had since taken advantage of their powers to reduce the discount they had previously allowed upon the water accounts to property owners. They were now applying for powers to construct a new reservoir; and it seemed that their water undertaking was not paying. By a clause in the new Bill, they sought to be empowered to levy a water-rate over all the area supplied with water from them whenever there was a deficiency in the water account. This rate would be in addition to the charges already made; and no limit was placed upon the amount of the rate they might levy. It was a most extraordinary clause, as power would be given the Corporation to levy a rate of 2d., 3d., or more upon Little Lever, independent of the Local Board. Moreover, they took to themselves any profits that might be derived, and made the out-townships share with them in any deficiency. The Board have suspended any action in the matter at present. It is reported that the Radcliffe Local Board have retained Counsel to oppose the Bill.

THE PROPOSED PURCHASE OF THE MANSFIELD WATER-WORKS BY THE IMPROVEMENT COMMISSIONERS.—At last month's ordinary meeting of the Mansfield Improvement Commissioners, the Clerk reported that he had received a letter from the Chairman of the Water Company, in reply to the copy of a resolution arrived at by the Commissioners at their previous meeting, respecting the proposed purchase of the water-works. The Company said the Commissioners were aware that the Company had no desire to sell their property; but, at the same time, the Directors did not seek to prevent by unreasonable demand, the control of the water supply being transferred to the Commissioners, if it was considered to be of advantage to the public. The Directors believed that the terms they had already named (£32,000) were reasonable, having regard to all the circumstances of the case; and they were certainly not prepared to recommend the shareholders to accept the offer made by the Commissioners (£26,000). The Directors were, however, willing to give full consideration to any further offer the Commissioners thought proper to make; and they were willing to meet a deputation of the Commissioners, to discuss the question fairly on its merits, and without prejudice. The matter, after some discussion, was referred to the Water Committee. Commenting on this matter, the *Nottingham Express* says: "At present there is only a difference of £6000 between the amount offered by the Commissioners and the amount the Company are willing to accept. Looking at the enormous sums awarded in arbitration for the purchase of water-works by municipal authorities, this difference appears an insignificant sum. Possession in this case is 'nine points of the law;' and a Company enjoying a monopoly under an Act of Parliament can hardly be expected to give up its rights and privileges just when the speculation in which it embarked at a time when private enterprise was not forthcoming to cope with the difficulty, is paying a handsome dividend. Under such circumstances it is much better for a Board of Improvement Commissioners to make a sacrifice than to put off the 'evil day' indefinitely. The neighbouring town of Sutton-in-Ashfield has shown what can be done with a water supply in the hands of the Local Board; and Mansfield having now completed the payment of a heavy loan for street improvements is in an exceptionally good position for entering into further responsibilities for the domestic and sanitary comfort of the inhabitants—to say nothing of the profitable nature of the water business when properly managed."

ELECTRIC LIGHTING IN ST. JAMES'S.—Last Thursday, a meeting was held in Willis's Rooms, of residents in the neighbourhood, in opposition to the working of an electric lighting engine and apparatus in Mason's Yard, Duke Street. Mr. Keevil took the chair, and stated that the sole reason why he initiated action in this matter was that he formed one of the minority in the Vestry that opposed the placing of the electric light installation in the place proposed. He contended that it would be a source of nuisance, perhaps danger, to the surrounding property, the commercial and residential value of which must be injured. He moved a resolution, which was carried, condemning the erection of the installation in St. James's or Pall Mall as unnecessary, in view of the facilities for bringing the current from localities more suited to the purpose.

FURTHER COMPLAINTS AS TO THE ELECTRIC LIGHT AT LEAMINGTON.—According to a local paper, during the past week complaints have been loud and numerous respecting the unsatisfactory condition of the electric light at Leamington. Some time ago the Corporation agreed to a month's experiment of three different systems, and the ratepayers have had an opportunity of judging which, if either, of the three lights is an improvement on the system previously in operation. On the Parade, near the Town Hall, says our contemporary, are four large arc lights, which have of late been as uncertain as it is possible for an electric lamp to be. On no evening during the week has there been a continuous light by all four lamps at one and the same time; and the average is about one in four. On one occasion they were all out; and the main thoroughfare of the town was left in total darkness. There is every probability that, at the next meeting of the Council, notice will be given the Company to terminate the contract.

ANNUAL STATISTICS OF THE CLITHEROE CORPORATION WATER DEPARTMENT.—At the last meeting of the Clitheroe Town Council, the minutes submitted by the Gas and Water Committee contained the Borough Accountant's statement of the working of the Water Department during the past year. From this it appears that the actual expenditure was £2364; and the actual revenue, £2190—showing a loss of £174. The annual domestic consumption, at 12½ gallons per head of a population of 11,300, amounted to 51,556,250 gallons; and the actual quantity sold for trade purposes was 21,691,200 gallons—being a total of 73,247,450 gallons; and at a cost of £2364, equal to 7·74d. per 1000 gallons. The revenue for domestic purposes was £1698 for 51,556,250 gallons, equal to 7·90d. per 1000 gallons; for trade purposes, £492 for 21,691,200 gallons, equal to 5·44d. per 1000 gallons. There was a loss of £174 on trade consumption, equal to 1·92d.; and a profit on the domestic supply, taken as trade consumption, equal to 0·38d.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For STOCK MARKET INTELLIGENCE, see *ante*, p. 61.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.				£ s. d
590,000	10	12 Oct.	10½	Alliance & Dublin 10 p. c.	10	18—19	−½	5 10 6
100,000	10	„	7½	Do. 7 p. c.	10	12½—13½	..	5 11 1
800,000	100	2 Jan.	5	Australian (Sydney) 5% Deb.	100	110-112*	+½	4 9 3
100,000	20	29 Nov.	10	Bahia, Limited	20	24—25	..	8 0 0
200,000	5	14 Nov.	7½	Bombay, Limited	5	7—7½	+½	5 0 0
40,000	5	„	7½	Do. New	4	5—5½	..	5 9 1
380,000	Stck.	29 Aug.	11½	Brentford Consolidated	100	223—228	..	5 3 1
125,000	„	„	8½	Do. New	100	165—170	+1½	5 2 11
220,000	20	13 Sept.	10½	Brighton & Hove, Original	20	43—45	..	4 13 4
320,000	20	28 Sept.	11½	British	20	43—45	..	5 0 0
50,000	10	13 Sept.	11	Bromley, Ordinary 10 p. c.	10	20—22	+1	5 0 0
39,000	10	„	8	Do. 7 p. c.	10	13½—14½	+½	5 10 4
328,750	10	14 Nov.	8	Buenos Ayres (New) Limited	10	13½—14½	..	5 10 4
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	100	107-109*	..	5 10 1
150,000	20	10 Aug.	7	Cagliari, Limited	20	26—28	..	5 0 0
550,000	Stck.	12 Oct.	13⅓	Commercial, Old Stock	100	257—262	..	5 4 11
130,000	„	„	10½	Do. New do.	100	209—214	..	5 0 5
180,000	„	28 Dec.	4½	Do. 4½ p. c. Deb. do.	100	122-125*	..	3 12 0
557,320	20	13 Dec.	14	Continental Union, Limited	20	44—46	..	5 13 0
242,680	20	„	13	Do. New '69 & '72	14	30—32	..	5 13 7
200,000	20	„	10	Do. 7 p. c. Pref.	20	36—38	..	5 5 3
75,000	Stck.	28 Sept.	10	Crystal Palace District	100	205—215	..	4 18 0
234,060	10	27 July	13	European, Limited	10	25½—26½	..	4 18 1
120,000	10	„	13	Do. New.	7½	18—19	..	5 2 7
354,060	10	„	13	Do. do.	5	12—13	..	5 0 0
5,468,600	Stck.	29 Aug.	13	Gaslight & Coke, A, Ordinary	100	251—255	+3	5 1 11
100,000	„	„	4	Do. B, 4 p. c. max.	100	100—105	..	3 16 8
665,000	„	„	10	Do. C, D. & E, 10 p.c. Pf.	100	261—265	+2½	3 15 6
30,000	„	„	5	Do F, 5 p. c. Prf.	100	125—130	..	3 16 11
60,000	„	„	7½	Do. G, 7½ p. c. do.	100	182—187	..	4 0 2
1,300,000	„	„	7	Do. H, 7 p. c. max.	100	169—174	+2	4 0 5
463,000	„	„	10	Do. J, 10 p. c. Prf.	100	260—264	+3½	3 15 10
1,061,150	„	13 Dec.	4	Do. 4 p. c. Deb. Stk.	100	117—120	..	3 6 8
294,850	„	„	4½	Do. 4½ p. c. do.	100	122—127	..	3 10 10
650,000	„	„	6	Do. 6 p. c. do.	100	173—177	+2	3 7 10
8,600,000	Stck.	14 Nov.	10	Imperial Continental	100	207—210	+3	4 15 8
75,000	5	13 Dec.	6	Malta & Mediterranean, Ltd	5	5—5½	..	5 9 1
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p.c. Deb.	100	114—116	..	4 6 2
541,920	20	29 Nov.	6	Monte Video, Limited	20	19—20	..	6 0 0
150,000	5	29 Nov.	10	Oriental, Limited	5	9—9½	+½	5 5 3
60,000	5	28 Sept.	7	Ottoman, Limited	5	6—7	..	5 0 0
166,870	10	27 July	4	Pará, Limited	10	5½—6½	..	6 3 1
420,000	100	2 Nov.	6	People's Gas of Chicago—1st Mtg. Bds.	100	104—107	..	5 12 1
500,000	100	1 Dec.	6	2nd Do.	100	92—97	..	6 3 9
100,000	10	12 Oct.	10	San Paulo, Limited	10	15½—16½	..	6 1 2
500,000	Stck.	29 Aug.	15½	South Metropolitan, A Stock	100	299—304	+2	5 1 11
1,350,000	„	„	12	Do. B do.	100	234—239	+2½	5 0 5
141,500	„	„	13	Do. C do.	100	245—255	..	5 1 11
600,000	„	28 Dec.	5	Do. 5 p. c. Deb. Stk.	100	137-140*	..	3 11 5
60,000	5	29 Aug.	11	Tottenham & Edm'ntn, Orig.	5	11—13	..	4 4 0
				WATER COMPANIES.				
717,467	Stck.	28 Dec.	9	Chelsea, Ordinary	100	256-261*	..	3 9 0
1,720,560	Stck.	12 Oct.	7	East London, Ordinary	100	200—203	+1	3 9 0
700,000	50	13 Dec.	9	Grand Junction.	50	121—125	..	3 12 0
708,000	Stck.	10 Aug.	10½	Kent	100	277—282	+2	3 14 5
1,043,800	100	28 Dec.	9	Lambeth, 10 p. c. max.	100	252-257*	..	3 10 0
406,300	100	„	7½	Do. 7½ p. c. max.	100	197-202*	..	3 14 3
200,000	Stck.	28 Sept.	4	Do. 4 p. c. Deb. Stk.	100	117—120	..	3 6 8
500,000	100	27 July	12½	New River, New Shares	100	350—360	..	3 7 4
1,000,000	Stck.	„	4	Do. 4 p. c. Deb. Stk.	100	132—127	..	3 3 0
902,300	Stck.	13 Dec.	6	S'thwk & V'xhall, 10 p.c. max.	100	165—170	−1	3 10 7
126,500	100	„	6	Do. 7½ p. c. do.	100	158—163	..	3 13 7
1,155,066	Stck.	„	10	West Middlesex	100	262—267	+1½	3 14 11

* Ex div.

BUCKLEY GAS COMPANY, LIMITED.—Last Wednesday evening, a public meeting was held at Buckley, at which the clauses of the Provisional Order which this newly-formed Company are applying for, were read. A number of questions were put to the representives of the promoters, and evidently answered to satisfaction, seeing the following resolution was passed:—"That this meeting approves of the Buckley Gas Company, and feels that it will be a long-felt want supplied." The Hope and Hawarden Local Board at their last meeting consented to the Company's scheme for the supply of Buckley and the neighbourhood.

THE COSTS OF OPPOSITION TO THE HALIFAX WATER BILL.—The bill of costs of the Sowerby Bridge Local Board in connection with the opposition last session to the Bill of the Halifax Corporation in the House of Lords, by which the Local Board succeeded in getting the price of water reduced 1d. per 1000 gallons, was taxed, on the 21st ult., at the House of Lords. The total allowed was £791 19s., which included, among other minor items, Counsels' fees, £219 9s.; witnesses' charges and expenses, £100 17s.; Engineers' fees and expenses, £122 7s.; House of Lords fees, £33 12s.; Parliamentary Agents' charges, £68 16s.; and Solicitors' charges, £183.

THE CHARGES FOR WATER AT STRATFORD-ON-AVON.—The monthly meeting of the Stratford Corporation was held last Tuesday, when the Water-Works Committee presented a report, suggesting that they be empowered to make a small charge per quarter for water used solely for flushing purposes. The Committee's recommendation was strongly criticized. Alderman Colbourne reminded the Council that at the last Local Government inquiry, the Inspector told them that their water charges were too low to meet the amount of interest chargable on the heavy loans granted; and it was with great difficulty the last loan was sanctioned. Mr. Allen proposed a sliding scale of charges, beginning at 1s. per quarter for houses of £10 rental and under; but Alderman Cox moved that the whole matter should be referred back to the Committee. The voting was equal, and the Mayor gave his casting vote for the amendment.

THE WATER SUPPLY SCHEMES FOR BARROW.—A special meeting of the Barrow-in-Furness Corporation has been held, for the purpose of affixing the common seal of the borough to a petition for a Bill in Parliamen, seeking powers to bring water from the Duddon Valley. Alderman Fish proposed an amendment that the Council do not petition. He contended that the Council had not treated the Barrow Hæmatite Steel Company fairly in the negotiations which had been carried on. He also maintained that the members of the Council practically knew nothing of what was in the Bill; and to promote it would be a suicidal, high-handed, and dog-in-the-manger policy. Alderman Strongitharm and other members of the Council warmly repudiated the assertion that the Council had treated the Steel Company unfairly. Alderman Strongitharm also pointed out that the Parliamentary Sub-Committee, of which Alderman Fish was a member, had gone through the Bill clause by clause; and that the Bill had been drafted from information obtained from the other Committees of the Council. The discussion was of a very animated character; but ultimately the amendment was defeated by 23 votes to 2.

THE QUALITY OF THE LONDON GAS SUPPLY

DURING THE FOUR WEEKS ENDED JAN. 1.

[From returns to the Metropolitan Board of Works by Mr. W. J. DIBDIN, F.I.C., F.C.S.]

COMPANIES—DISTRICTS.	ILLUMINATING POWER. (In Standard Sperm Candles.)						SULPHUR. (Grains in 100 Cubic Feet of Gas.)						AMMONIA. (Grains in 100 Cubic Feet of Gas.)					
	Maximum.	Minimum.	Means.				Maximum.	Minimum.	Means.				Maximum.	Minimum.	Means.			
			Dec. 11	Dec. 18	Dec. 25	Jan. 1			Dec. 11	Dec. 18	Dec. 25	Jan. 1			Dec. 11	Dec. 18	Dec. 25	Jan. 1
The Gaslight and Coke Company—																		
Notting Hill	17·0	16·2	16·5	16·6	16·8	16·4	12·1	9·2	10·1	11·0	11·2	9·9	0·8	0·0	0·4	0·4	0·2	0·2
Camden Town	17·3	15·9	16·6	16·6	16·8	16·6	19·3	10·1	16·4	14·0	17·6	14·6	0·2	0·0	0·1	0·1	0·1	0·0
Dalston	16·8	16·0	16·4	16·2	16·5	16·4	21·0	13·4	16·2	16·5	18·6	15·5	0·1	0·0	0·0	0·0	0·0	0·0
Bow	17·3	16·0	16·7	16·7	17·0	16·5	10·9	4·8	7·8	8·3	8·6	7·6	0·5	0·0	0·2	0·2	0·2	0·0
Chelsea (Fulham)	16·8	15·9	16·2	16·0	16·6	16·2	17·5	14·1	14·9	15·9	15·6	15·7	0·5	0·1	0·2	0·3	0·4	0·3
Do. (Nine Elms)	16·6	16·0	16·2	16·0	16·4	16·3	12·2	10·4	11·0	11·7	12·2	11·5	0·4	0·2	0·3	0·3	0·2	0·3
Shoreditch	17·5	16·2	16·7	16·7	17·1	16·4	16·7	8·3	11·4	11·1	12·0	11·8	0·4	0·0	0·0	0·0	0·0	0·1
Charing Cross (48-inch main)	17·1	15·9	16·6	16·2	16·7	16·7	13·0	8·5	9·6	10·1	11·1	8·5	0·3	0·0	0·2	0·1	0·1	0·2
Do. (district main)	16·9	16·4	16·6	16·5	16·8	16·6	12·4	8·5	8·8	10·1	9·8	10·0	0·4	0·0	0·2	0·0	0·0	0·2
St. John's Wood	17·2	16·0	16·2	16·2	16·3	16·6	13·0	8·9	10·9	11·6	12·5	10·8	0·6	0·2	0·3	0·4	0·3	0·4
Lambeth Road	16·8	16·2	16·5	16·4	16·6	16·5	14·1	9·8	11·0	12·6	12·6	10·5	0·6	0·0	0·2	0·0	0·4	0·5
Holloway	17·9	15·6	16·7	16·5	17·1	16·3	14·C	8·8	11·4	11·4	12·7	11·3	0·3	0·0	0·2	0·1	0·2	0·1
Westminster (cannel gas)	21·4	20·0	20·2	20·1	20·7	20·6	16·0	9·1	10·2	10·2	12·0	12·0	2·0	0·3	0·4	0·3	0·7	1·5
South Metropolitan Gas Company—																		
Peckham	16·9	16·1	16·3	16·3	16·6	16·6	17·3	9·9	12·0	12·5	14·4	14·7	0·6	0·1	0·3	0·1	0·3	0·4
Tooley Street	17·6	16·1	16·6	16·4	16·9	16·5	14·5	8·5	10·7	11·0	12·4	11·2	2·0	0·0	1·0	0·5	0·4	0·3
Clapham	16·7	16·0	16·1	16·3	16·4	16·3	16·3	10·5	12·6	11·2	12·1	13·3	0·2	0·0	0·1	0·0	0·0	0·0
Lewisham	16·9	16·0	16·3	16·2	16·6	16·5	10·3	6·2	8·0	9·5	9·4	9·3	0·0	0·0	0·0	0·0	0·0	0·0
Blackfriars Road	16·7	15·4	16·0	16·4	*	*	12·8	8·8	9·7	12·1	*	*	1·0	0·2	0·5	0·6	*	*
Plumstead	17·8	15·3	16·1	15·6	16·7	17·1	14·0	7·2	10·8	12·0	10·3	11·6	0·8	0·0	0·4	0·5	0·1	0·3
Commercial Gas Company—																		
Old Ford	17·2	16·1	16·7	16·3	16·7	16·5	10·0	4·5	5·6	6·4	7·6	7·3	0·4	0·0	0·0	0·0	0·1	0·0
St. George's-in-the-East	17·0	15·7	16·3	16·4	16·5	16·0	16·7	8·6	10·3	12·6	15·2	12·7	0·4	0·1	0·2	0·2	0·3	0·3

* Station closed for alteration.

SULPHURETTED HYDROGEN.—None on any occasion. PRESSURE.—In excess on all occasions.

Note.—The standard illuminating power for common gas in the Metropolis is 16 sperm candles, and for cannel gas 20 sperm candles. Sulphur not to exceed 22 grains in 100 cubic feet of gas; ammonia not to exceed 4 grains in 100 cubic feet of gas. Pressure between sunset and midnight to be equal to a column of 1 inch of water; between midnight and sunset, 6-10ths of an inch.

GWYNNE & CO., ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C.

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS & ENGINES.

Telegrams: "GWYNNEGRAM, LONDON." Telephone No. 2698.

Exhausters of nearly all sizes in Stock.

Prize Medals at all the Great International Exhibitions.

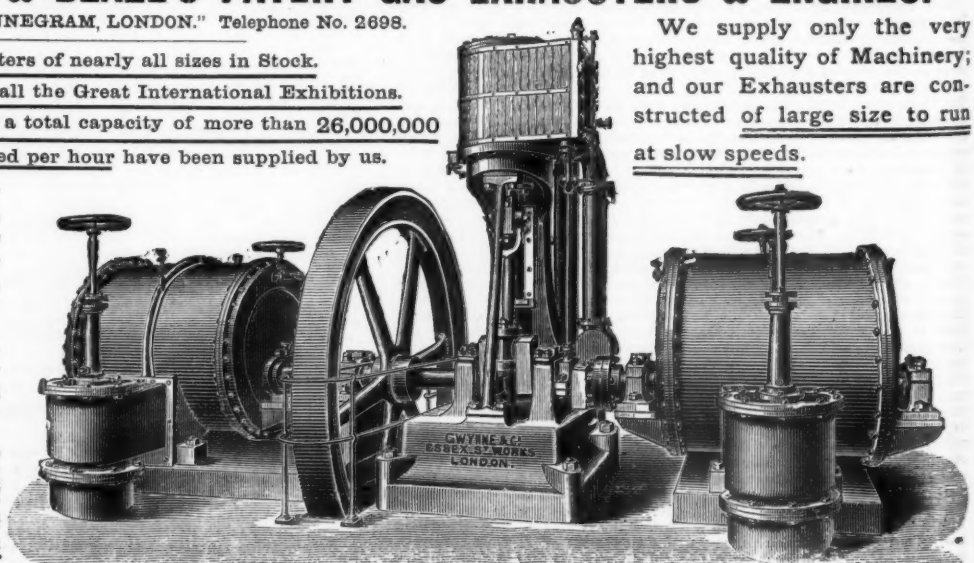
Exhausters equal to a total capacity of more than 26,000,000 cubic feet passed per hour have been supplied by us.

We supply only the very highest quality of Machinery; and our Exhausters are constructed of large size to run at slow speeds.

Our new Patent Non-Fluctuating Exhausters, to work without the slightest oscillation or variation in pressure, are strongly recommended.

MAKERS OF EVERY DESCRIPTION OF HYDRAULIC AND GAS MACHINERY.

Gwynne & Co.'s New Catalogue and List of Testimonials can now be obtained on application.



Exhausters and Vertical Engine as supplied for both the Fulham and Bromley-by-Bow Stations of The Gaslight and Coke Company.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

ANDREW STEPHENSON, Agent for the GAS PURIFICATION AND CHEMICAL COMPANY, Limited, Palmerston Buildings, Old Broad Street, LONDON, E.C.

CANNEL COAL, &c.

JOHN ROMANS & SON, EDINBURGH. Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.
Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, } SCOTLAND.
No. 54, BERNARD STREET, LEITH, }

SULPHURIC ACID, B.O.V., for Sulphate of Ammonia Making. Guaranteed clear, of full strength, and to produce a fine white-coloured salt Delivered in carboys or railway tank waggons.
For prices and terms address BALE, BAKER, AND CO., 120 & 121, Newgate Street, LONDON.

THE GAS INSTITUTE.

THE Council respectfully request that all SUBSCRIPTIONS and COMMUNICATIONS relative to THE GAS INSTITUTE be addressed to Mr. Longworth, Gas Offices, Guildford, who has been appointed Honorary Secretary, *pro tem.*
Dec. 29, 1888.

TO GAS-METER MANUFACTURERS.

WANTED, Situation as Index Maker. Thorough knowledge of both Wet and Dry Meter Work; town or country.
Address H. J. W., 72, Moreland Street, City Road, LONDON, E.C.

WANTED, by a Total Abstainer, a Situation in a Gas-Works as WORKING MANAGER or FOREMAN. Has had good practical experience in Carbonizing, Fitting, Main and Service Laying, Reading Meters, and Repairs connected with Gas Plant. Good testimonials. Married.
Address No. 1668, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a young Man, age 23 (an Abstainer), a SITUATION in Main and Service Laying, Reading and Fixing Meters, and Jobbing Work if required. Willing to make himself useful on Works. Good references.
Address G. K., The Elms, Hythe, KENT.

WANTED, a thoroughly qualified and competent GAS ENGINEER for the Montreal Gas Company, Canada.
Applicants must enclose testimonials, and state age, experience, and salary.
Applications received up to the 31st of January inst., addressed to J. F. SCRIVEN, Manager of the Montreal Gas Company, care of Mr. King, 11, Bolt Court, Fleet Street, LONDON, E.C.

FOR SALE.

THE Gas Committee of the Corporation of Wigan have FOR DISPOSAL—for which they invite Offers—a quantity of RETORT-BENCH FITTINGS (some equal to new), consisting of Mouthpieces, Ascension-Pipes, Bridge-Pipes, Dip-Pipes, Hydraulic Mains, Foul Mains, Sundry Valves, and Connections.
The Committee do not bind themselves to accept the highest or any offer.
For the convenience of purchasers, this material may be sold in lots.
Offers may be addressed, under cover, sealed and endorsed "Retort Mountings," to Ralph Darlington, Esq., Town Clerk, Corporation of Wigan, on or before the 31st of January inst.; and all particulars may be obtained on application to the undersigned.
Jos. TIMMINS, Engineer, &c.
Borough Gas-Works, Wigan, Jan. 3, 1889.

THE Oxford Gaslight and Coke Company have FOR SALE a Double-Lift GASHOLDER in Cast-Iron Tank, with Guide-Framing complete. Capacity, 90,000 feet.
Offers (including removal) to Mr. ELDRIDGE, Engineer and Manager, who will give any further information.

BRISTOL UNITED GASLIGHT COMPANY.

AMMONIACAL LIQUOR.

THE Directors of this Company invite TENDERS for the purchase of the AMMONIACAL LIQUOR to be produced at all or either of their three Stations during a period of One, Three, Five, or Seven years, commencing on the 1st day of July, 1889.
The annual quantities and strengths of the Liquor produced at each of the Stations at present are approximately as follows:—

	Gallons.	
Canons' Marsh Station,	1,000,000	of 14 ounce Strength.
Avon Street "	1,300,000	" 15 " "
Stapleton "	700,000	" 17 " "

Conditions of Contract, and forms of tender, may be obtained on application to the undersigned, to whom also tenders, sealed, and endorsed "Tender for Ammoniacal Liquor," must be delivered not later than Ten a.m. on Monday, the 28th day of January, 1889.
The Directors do not bind themselves to accept the highest or any tender.
JAS. V. GREEN, Secretary.
Chief Offices: Canons' Marsh,
Bristol, November, 1888.

TIMMIS & CO., of STOURBRIDGE Make only the best quality of FIRE-CLAY RETORTS, BRICKS, TILES, & LUMPS. Also SPECIAL SILICA BRICKS, to stand great heats. All descriptions kept in Stock.
For Prices apply to JAMES LAWRIE AND CO, 65, Old Broad Street, E.C., Sole Agents for London and District. Telegraphic Address: "EIRWAL, LONDON."

ALEX. WRIGHT & Co., 55, 55a, and 56, MILLBANK STREET, LONDON, S.W.
[Telegraphic Address: "PRECISION LONDON."]
Makers of Wet and Dry Gas-Meters, Station Meters and Governors, Photometers, and Gas-Testing Apparatus, Test Gasholders and Meters, Registering and other Gauges, &c., &c.
. See Advertisement on Page III. of the Wrapper of last week's issue.

W. C. HOLMES & Co., Huddersfield, AND 80, CANNON STREET, LONDON,
Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
. See Advertisement p. 88 of this week's issue.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

BIDDULPH, ETC., GAS-WORKS, NEAR CONGLETON.

THE Directors of the above Company invite TENDERS for their surplus TAR and AMMONIA WATER, together or separate, for One year, from the 1st of January, 1889.
Tenders to be sent to the undersigned, from whom further information may be obtained.
A. SHIRES, Manager.

NEW ROMNEY GASLIGHT AND COKE COMPANY, LIMITED.

ISSUE OF DEBENTURE BONDS.

THE above Company, in raising their new Capital, are issuing fourteen DEBENTURE BONDS of £50 each, for which TENDERS are invited.
All tenders must be in writing, and state the number of bonds the applicant is willing to take, and what rate of interest will be accepted.
WM. ALLEN, Secretary.
New Romney, Kent.

THE Gas Committee of the Leeds Cor- poration are prepared to receive TENDERS for the supply of WET and DRY GAS-METERS, to be delivered at their Gas-Works, during a period of Twelve months from receipt of order.
Each party tendering is required to send, on or before Saturday, the 12th inst., two samples of 5-light Meters of each description offered (one of which is to be unscrewed for examination), and also list of guaranteed weights of Drums of all sizes, addressed to Mr. Lupton, Gas-Meter Works, Dewsbury Road, Leeds, from whom forms of tender may be obtained on application at the Offices of the Gas Department, Municipal Buildings, Leeds.
Endorsed tenders addressed to the Chairman of the Gas Committee, at the latter address, will be received not later than Wednesday, the 16th inst.
The Committee do not bind themselves to accept the lowest or any tender.

THE Gas Committee of the Leeds Cor- poration solicit TENDERS for the supply of FIRE-CLAY RETORTS, FIRE-BRICKS, LUMPS, and FIRE-CLAY.
Particulars as to quantity, together with forms of tender, may be obtained of Mr. Lupton, Gas Department, Municipal Offices, Leeds.
Tenders, addressed to the Chairman, at the above address, will be received not later than Wednesday, the 16th inst.

TENDERS FOR LIGHTING THE BOROUGH OF CHELMSFORD.

THE Town Council are prepared to receive TENDERS (*a*) for LIGHTING the PUBLIC LAMPS with GAS or OIL, and for Extinguishing, Cleaning, Painting, and Repairing them, for One Year, Three Years, or Five Years; (*b*) also for Lighting the Town by ELECTRICITY for same periods.
Full particulars may be obtained of Mr. Charles Pertwee, Borough Surveyor, Chelmsford.
Tenders, sealed and endorsed "Tender for Lighting," to be delivered at the Office of the Town Clerk, 18, Duke Street, Chelmsford, before Twelve o'clock at noon on Thursday, the 17th of January inst.
The Council do not bind themselves to accept the lowest or any tender.
By order,
THOS. DIXON, Town Clerk.
Chelmsford, Jan. 1, 1889.

THE Birstal Local Board are prepared to receive TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR (the latter at 4°, 5°, and 6° by Twaddel's Hydrometer respectively) made or produced by them at their Gas-Works, Smithies, Birstal, adjoining the London and North-Western Railway Station, for One, Two, or Three years, at the option of the Local Board, from the 1st day of January, 1889.
Tenders, stating price per ton for each article, and for the liquor at each strength, sealed and endorsed, must be sent to me not later than Twelve o'clock at noon on Tuesday, the 15th of January, 1889.
The successful contractor will, at his own expense, have to enter into an agreement and bond with and to the Board for the due performance of his contract.
The Local Board do not bind themselves to accept the highest or any tender.
For further particulars apply at the Gas-Works Offices, or to
WM. MIDDLEBROOK,
Solicitor and Clerk to the Board.
Birstal, near Leeds, Dec. 31, 1888.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application. Spent Oxide and Sulphate of Ammonia purchased.
120 and 121, NEWGATE STREET, LONDON, E.C.

TUBES.

FOR Gas, Steam, and Water; Galvanized, White Enamelled, and Hydraulic Tubes and Co
JOHN SPENCER, Globe Tube Works, WEDNESBURY and 14, Great St. Thomas Apostle, LONDON.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID for making SULPHATE OF AMMONIA of high quality and colour.
Highest References and all particulars supplied on application.

HUTCHINSON BROTHERS, Barnsley, Gas Engineers and Contractors, Makers of Gas-Meters and General Gas Apparatus, Sulphate of Ammonia Plant, Tools, and Sundries.
. See large Advertisement in last week's issue, page 911.

SMETHWICK LOCAL BOARD OF HEALTH.

SPENT OXIDE.

THE Gas Committee invite Tenders for the purchase of about 150 tons of SPENT OXIDE now in stock at the Gas-Works.
Samples and further information may be obtained from Mr. B. W. Smith, Gas-Works, Rabone Lane, Smethwick.
Tenders, stating price per unit of sulphur, to be sent in to the undersigned not later than Jan. 24.
W. J. STURGES, Secretary.
Public Buildings, Smethwick.

TAR AND AMMONIACAL LIQUOR.

TENDERS are invited for the purchase of the SURPLUS TAR and AMMONIACAL LIQUOR produced at the following Works during a period of One, Two, or Three years, from the 1st of January, 1889:—
Rhos Gas Company, Limited, Ruabon.
Ruabon Coal and Coke Company's Gas-Works, Ruabon.
Westminster Colliery Company's Works, near Wrexham.
Barmouth Gas-Works.
Offers to be sent to the undersigned, from whom further information may be obtained.
GEO. E. WOODFORD.
Ruabon, Dec. 29, 1888.

BOROUGH OF SALFORD.
(GAS DEPARTMENT.)

SPENT OXIDE.

THE Gas Committee invite Tenders for the purchase of about 120 tons of SPENT OXIDE now at their Bloom Street Works.
Forms of tender and all particulars may be obtained on application to the Engineer, Mr. S. Yarrell Shoubridge, Gas Offices, Bloom Street.
Sealed tenders, endorsed "Tender for Spent Oxide," and addressed to the Chairman of the Gas Committee, must be delivered at the Town Clerk's Office, Town Hall, Salford, before 9.30 a.m. on the 16th of January inst.

CORPORATION OF LEICESTER.

CAST-IRON PIPE CONTRACT.

THE Gas Committee of the above Cor- poration are prepared to receive TENDERS for the supply of the necessary CAST-IRON PIPES and CONNECTIONS, from 3 inches to 24 inches in diameter, required during the Twelve months ending the 31st of December, 1889.
Specification and form of tender to be obtained from the Engineer.
Tenders, addressed to Councillor Lennard, Chairman, and endorsed "Tender for Cast-Iron Pipes, &c.," to be delivered at these Offices not later than Eleven o'clock a.m. on Saturday, Jan. 12, 1889, prox.
The Committee do not bind themselves to accept the lowest or any tender.
ALFRED COLSON, C.E., Engineer and Manager.
Gas Offices, Millstone Lane,
Leicester, Dec. 14, 1888.

MANUFACTURE AND SUPPLY OF GAS AT NETLEY.

THE Secretary of State for War is pre- pared to receive TENDERS for the MANUFACTURE and SUPPLY of GAS at the Royal Victoria Hospital, Netley, during the period of Six years, from the 1st of April, 1889.
The existing Gas-Works may be inspected, and printed forms of tender, and any further information obtained, on application to the Senior Commissariat Officer, Colewort Barracks, Portsmouth.
The tenders are to be delivered at the War Office, Pall Mall, S.W., by Twelve o'clock noon on Monday, the 14th day of January, 1889, addressed to the Director of Army Contracts, and marked on the outside "Tender for Gas at Netley."
EVAN COLVILLE NEPEAN,
Director of Army Contracts.
War Office, Pall Mall, S.W.,
Dec. 29, 1888.

Price 2s. per dozen, or 10s 6d. per 100, post free.

CONSPIRACY and Protection of Pro- perty Act. It is required, under a Penalty of FIVE POUNDS, that a Printed Copy of the 4th Section of this Act shall be posted up at all Gas-Works, in a conspicuous place, where the same may be conveniently read by the persons employed thereat.
Printed copies of this Section, in large type, on broad sheets, may be obtained of Mr. WALTER KING, 11, Bolt Court, FLEET ST., E.C.
. *The Act extends to Scotland and Ireland.*

TO INVENTORS AND PATENTEES.

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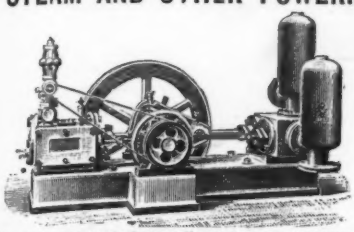

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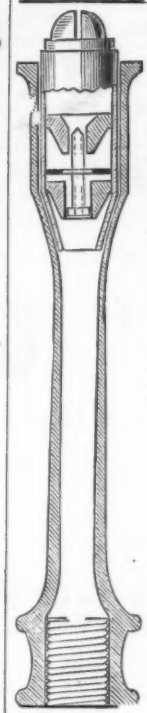

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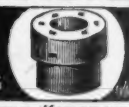

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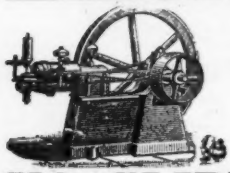

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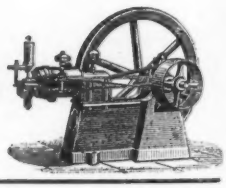

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POWER CHARGING AND DRAWING MACHINES, driven by Wire Rope, Steam, or Compressed Air.—The power machines are applicable to circular, oval, or Ω-shaped retorts and mouthpieces, and are the most perfect, economical, efficient, and durable machines made; they are constructed on principles founded by long and extensive experience in this special branch of gas engineering and the manufacture of gas.

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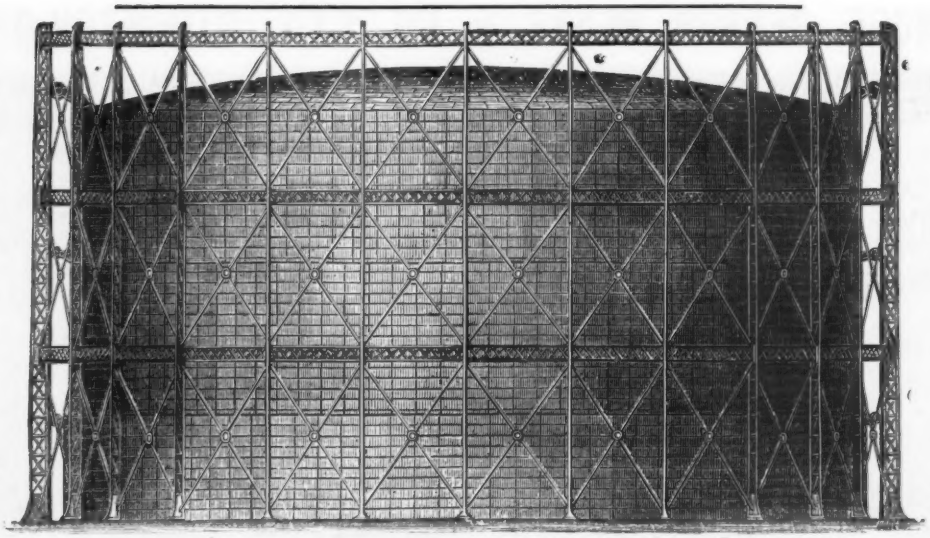

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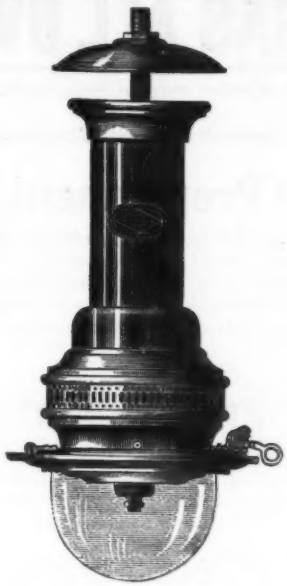


Lighting power with ordinary London Sixteen-Candle Gas, from tests taken by Professor Wm. Foster, M.A., L.R.C.S.

No. 10, 11·4-Candle Power, per foot.
No. 11, 12·5 ,, ,,
No. 12, 12·5 ,, ,,

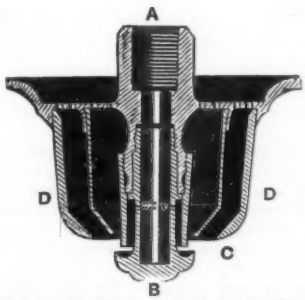
These Lamps are made in three sizes, Nos. 10, 11, 12.

A *Connection to Gas Supply.*

B *The inserted perforated Burner.*

C *The depending Curtain or Tube to guide the issue of the Gas into the Annular Cup.*

D *The outer Annular Nozzles contracted at the lower end.*



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The Advantages of this Patent over other existing Lamps are—

Small Consumption of Gas with great Illuminating Power.

No possibility of the Burner corroding or getting out of order, as is the case with other Generative Gas-Lamps.

The Lamp can be fitted by any Gas-fitter. No fine Perforated Metal, Gauze, or other obstructions are used in this Patent, as in other Lamps, which are liable to become choked through imperfect combustion, rendering the Lamps smoky and useless.

These Lamps can be obtained through Gas-fitters, Ironmongers, and Merchants. Foreign Orders through Merchants only.

FOR FURTHER PARTICULARS, APPLY TO

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HOW TO SECURE THOUSANDS OF SMALL CONSUMERS OF GAS ALL OVER THE WORLD.

In these days there is a desire to save labour in every possible form, and the application of Automatic Machinery to all kinds of purposes proceeds with leaps and bounds.

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Brownhill's "Prepayment Gas-Meter"

Is a ready means for the Small Consumer to pay for his Gas in advance, and in small quantities, either daily, weekly, monthly, or at any given period in which a certain quantity will be required.

The result is a great benefit to the consumer, as he has no calls, dunning him for the "Money for the Gas," from collectors; if he has used his ONE PENNY'S WORTH, he can always drop in another PENNY without asking anyone. Has no fear of having his "Gas Cut Off," pays as much as he likes, consumes what he pleases, and is in every sense his own master, so far as Gas supply is concerned.

To Gas Companies and Gas Committees

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Offers enormous facilities for the extension of Gas supply, especially to Small Consumers. Statistics show that there are 50 per cent. non-consumers situated along the lines of Gas-Mains in districts where there is a good supply at the door. No expensive system of collection has to be adopted; and the cash is paid always before the Gas is consumed. Gas suppliers must look to the consumers of small quantities of Gas to increase the consumption of Gas. If

Brownhill's "Prepayment Gas-Meter"

be adopted, a blow will be directed at the dangerous use of mineral oils, by which 300 lives are annually lost within the United Kingdom. The artisan class will have a safe light always at their command; and they will find Gas cheaper, cleaner, and more wholesome than any oil in the market.

DESCRIPTION OF METER.

This Patent is a small attachment which can be applied to all Meters, new or old, and which will deliver gas in quantities as paid for by pence deposited in a box.

The attachment is made so that only one penny at a time can be put into the box. Although 143 pence can be put in consecutively, each penny will pay for sufficient gas for one burner, to last between six and eight hours. When a gas consumer pays a penny or any number of pence into the meter, the action of the meter will be at once operated upon to a proportionate extent. A dial will also at all times indicate the amount paid for, and not used. The light will diminish a quarter of an hour before the gas paid for is actually used up; thus giving notice that a further payment is required.

The object of the "Prepayment Gas-Meter" is to place the consumption of gas as easily within reach of the mass of the population as petroleum, candles, &c., so that it may be purchased even a pennyworth at a time, and without any initial outlay or trouble, such as deposit, reference, or guarantee, now required by the Gas Companies. The increased light and many conveniences of gas would thus be obtained economically; and the great danger from petroleum and benzoline, and the disagreeable smell from cheap lamps and oil, obviated.

An important consideration, which cannot be overlooked, is the duty of Gas Companies and Corporations, who have a first-class monopoly, to supply the working classes with gas, without the burden and restrictions which now exist.

It is anticipated that there will be a great demand for these Meters in houses of all classes, especially in those with rents ranging from £13 to £50 per annum, as it will be a great advantage to these occupiers to pay for their gas only as it is required, as for other household goods. **Occupiers will thus be able to control their weekly expenditure of Gas, and to check leakages and waste.**

The Meter will be in demand for—

(1) Sub-tenancies in large manufacturing premises where each sub-tenant has to pay for gas. This is a large class, both in London and the provinces.
(2) Stable and yard purposes, connected with hotels and other places of business.
(3) Householders generally, as, by using this attachment, caretakers or servants will only require pence to obtain their gas, and cannot use it beyond the amount paid for; and thus when houses are left in charge of caretakers or servants the consumption of gas would be controlled.
(4) Rooms or premises let for entertainments by day or week.

Messrs. Sommerville & Co, of 17, Temple Street, Birmingham, are now prepared to enter into Contracts with Gas Companies, Corporations, Local Boards, and Others for the supply of

Brownhill's "Prepayment Gas-Meter,"

and with Gas-Meter Manufacturers, for the right to adopt the prepayment principle. The system is an unqualified success. The meters have been examined by hundreds of Engineers and others interested in Gas supply, and have been favourably reviewed in the

"Journal of Gas Lighting," "Gas World," "Gas and Water Review," &c., &c.

PATENTEE:
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OVER 50 IN SUCCESSFUL OPERATION.

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Allows light Liquor Seals; prevents oscillation in Hydraulic Main, and consequently increases Illuminating Power of Gas.

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WRIGHT'S PATENT HYDROSTATIC GAS-IN-STOCK INDICATOR.

To provide accurate register of Gas in stock, by means of Hydrostatic Gauges connected with Gasholders. *See Advertisement in "Journal" for Sept. 18, 1888, p. 527.*

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A simple and very successful adaptation of Automatic Intermittent Syphons, to feed liquids into Scrubbers at regular intervals.

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LIVESEY & TANNER'S APPARATUS CAN BE FITTED TO MAINS OF ANY SHAPE OR SIZE.

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ASBESTOLINE is the most efficient Lubricant for all bearings.
ASBESTOLINE is the cheapest Lubricant.
ASBESTOLINE saves from 50 to 90 per cent. of the Cost of Oil.
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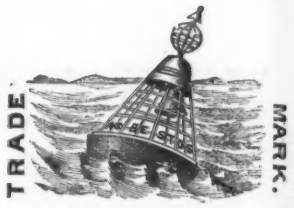
ASBESTOLINE is favoured by Insurance Companies.
ASBESTOLINE is the most Inodorous Lubricant.
ASBESTOLINE is the safest Lubricant from Ignition.
ASBESTOLINE has beaten all other Lubricants in trials.
ASBESTOLINE is applicable in and out doors in every Climate.
ASBESTOLINE requires no special application.



CONSISTENCY OF ASBESTOLINE.

ASBESTOLINE, to meet all circumstances, is made in four degrees of consistency—A, B, C, and CC.

ASBESTOLINE, A, is specially adapted to ordinary Land Engines and Machinery, in and out door, in this country.

ASBESTOLINE, B, a little more solid, is for use on Steamships in temperate climates, also on land when it is desirable to have Lubricant stiffer than A.

ASBESTOLINE, C, is for use in tropical climates, both ashore and afloat. It is also invaluable in works in this country when the temperature is high.

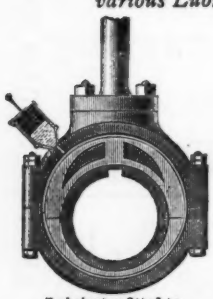
ASBESTOLINE, CC, is designed for use on Calenders, Paper-Machines, &c., where the bearings are heated by steam passing through, and sometimes is advantageously used instead of C.

The reputation of Asbestoline as a Lubricant of the highest efficiency in every kind of Machinery is established; and it has never been equalled by any other Lubricant in the numerous cases of special difficulty in which the best oils are ineffectual. It is used with marked success in Steel and Iron Works, Collieries, Cotton and Wool Mills, and other Textile Manufactories. In Corn-Mills it has proved invaluable on the roller and other modern machines. In Saw-Mills, on machines going up to 5000 revolutions per minute, its work has never been approached by any other Lubricant. On Electric Lighting Machinery, and in Steamships of all sizes throughout the world, the success of Asbestoline is unequalled. Many engines and machines of all descriptions give trouble, and show bad results both in working and wear, when the system of lubrication has not received due consideration. Engineering firms of the highest standing have given to it their powerful testimony and support.

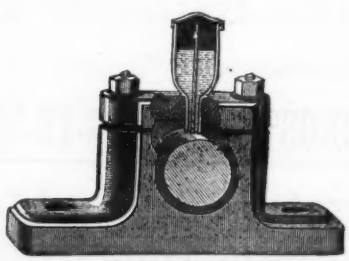
Supplied in Kegs, 28, 56, or 112 lb. Price, 2/3 per lb. Kegs Free. Special Terms for Large Quantities.

IMPORTANT TO EXPORT MERCHANTS.—*One pound of "Asbestoline" equals 2 gallons of Oil weighing 18lbs.; consequently the saving in freight is very considerable. Liberal Terms are conceded to Export Merchants.*

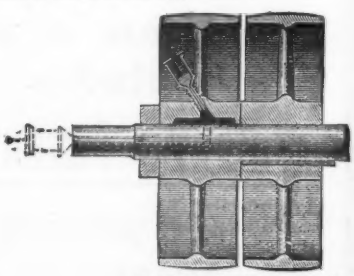
Below will be found illustrations of the mode of fixing Lubricators for Asbestoline to bearings. Full particulars of the various Lubricators supplied for Asbestoline, and the manner of fitting, in catalogue free on application.



Lubricator fitted to Eccentric of Vertical Engine



Showing Section of Lubricator fitted to ordinary Bearings.



Lubricator in different position for Loose Pulleys.

THE ATTENTION OF

ENGINEERS, AND ALL USERS OF STEAM POWER AND MACHINERY,

IS SPECIALLY INVITED TO THE FOLLOWING REPORT.

Owing to the number of Greases now offered, samples of BELL'S ASBESTOLINE were submitted to Otto Hehner, Esq., for analysis, and the subjoined Report fully proves BELL'S ASBESTOLINE to be the safest as well as the best Lubricant for all purposes:—

The Laboratory, 11, *Billiter Square, E.C., London, May* 3, 1888.

I have subjected a sample of Bell's Asbestoline taken from the stores of Messrs. J. Bell and Son, in Southwark Street, to a number of tests, in order to ascertain whether its use in Mills or Factories might contribute to the danger from Fire.

I found that Asbestoline **ignites only with the greatest difficulty** when brought into contact with flame; that wood and other combustible material soaked in Asbestoline burns, if anything, with greater difficulty than by itself; that its **flashing point** is so high that it lies beyond the range of **Mercurial Thermometers**; and that consequently no friction obtainable in the ordinary run of machinery is capable of developing inflammable vapours from it.

Bell's Asbestoline is as absolutely safe a Lubricant as can be desired or obtainable. In the case of fire breaking out from any cause, it does not assist the conflagration; and it is quite incapable of leading to spontaneous combustion, either by itself or in contact with inflammable material.

From the physical nature of Asbestoline its use is of necessity perfectly clean and free from waste.

(Signed) OTTO HEHNER, Public Analyst.

Illustrated Priced Catalogue, with numerous Testimonials by Leading Firms, free on application.

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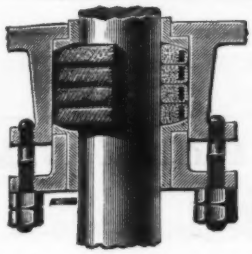
BELL'S ASBESTOS DAGGER PACKING

PATENT No. 15,498.



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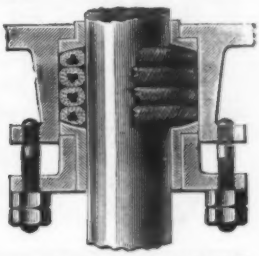

Every 10 feet has Label as above, and bears our Trade Mark.

Under this registered title are included the inventions of Mr. Field; and experience has proved them to be the MOST EFFICIENT, DURABLE, and ECONOMICAL PACKINGS ever made. They constitute such a combination of Asbestos and India-rubber as secures the maximum of elasticity and heat resistance; and they are, therefore, UNEQUALLED FOR EVERY KIND OF ENGINE. These Packings are being universally used by most of the leading Steamship Companies throughout the world for ordinary Compound, Triple, and Quadruple Expansion Engines of the latest type. The Packings are composed of rolled Asbestos Cloth, but the India-rubber is placed in two forms to suit various cases.

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Price of either Section, 5s. 6d. per lb. Steam Vulcanized, 6s. 6d. per lb.

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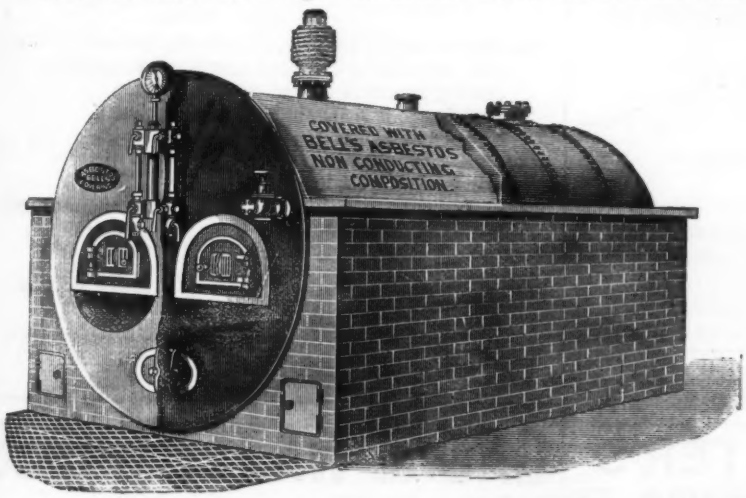
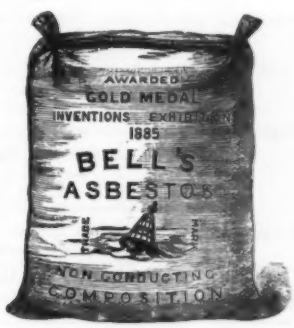
FOR COVERING BOILERS AND STEAM-PIPES,

Will reduce loss by radiation to a minimum and save 40 per cent. of fuel.





Price 25s. per Cwt.

Second Quality, 15s. per Cwt., is superior to the best sold by other Firms.

It is essential in covering that it shall not only be a non-conductor, but a substance free from whatever can injure metal, and of a nature which will enable it to adhere well for years. To do this it must be sufficiently elastic to prevent cracking and leaving, by expansion and contraction, the heated surfaces to which it is applied. This Composition is daily applied to Tanks with Round or Flat Bottoms, and its adhesive properties enable it to keep to the surfaces without bands or any device necessary for holding on other compositions. Our covering never fails to Save its Cost in a few months, lasts for years, after which it can be taken off and applied again with a little fresh. In all respects it is so superior as to be infinitely cheaper than Compositions sold at one-fourth the price. We would point out that this, being supplied dry in bag, will cover six times more surface than other materials which are sent out wet in cask. This shows the apparent low prices of other Compositions to be a sham.

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MOST INTENSE WHITE BRILLIANT GAS LIGHT.
MOST ECONOMICAL, SIMPLE, AND DURABLE.
DOES NOT GET OUT OF ORDER. RIVALS THE ELECTRIC LIGHT.
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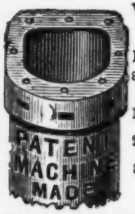

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Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing Adhesion of Carbon.
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MACHINE-MADE GAS-RETORTS.

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THE ADVANTAGES OF A WHITE, BRILLIANT, STEADY LIGHT ARE UNDENIABLE.

ENORMOUS SAVING OF GAS.

AN ACKNOWLEDGED SUCCESS. HAS STOOD THE TEST OF TEN YEARS.
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Easily applied to existing Fittings.
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Perfectly Simple and absolutely Safe.

Single Lights from 6/- upwards. Cluster Lights from 40/- to 145/-.

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Agencies Granted—Liberal Terms. Price List on application.

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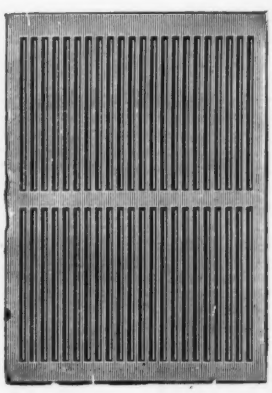

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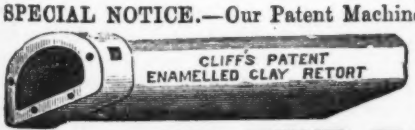

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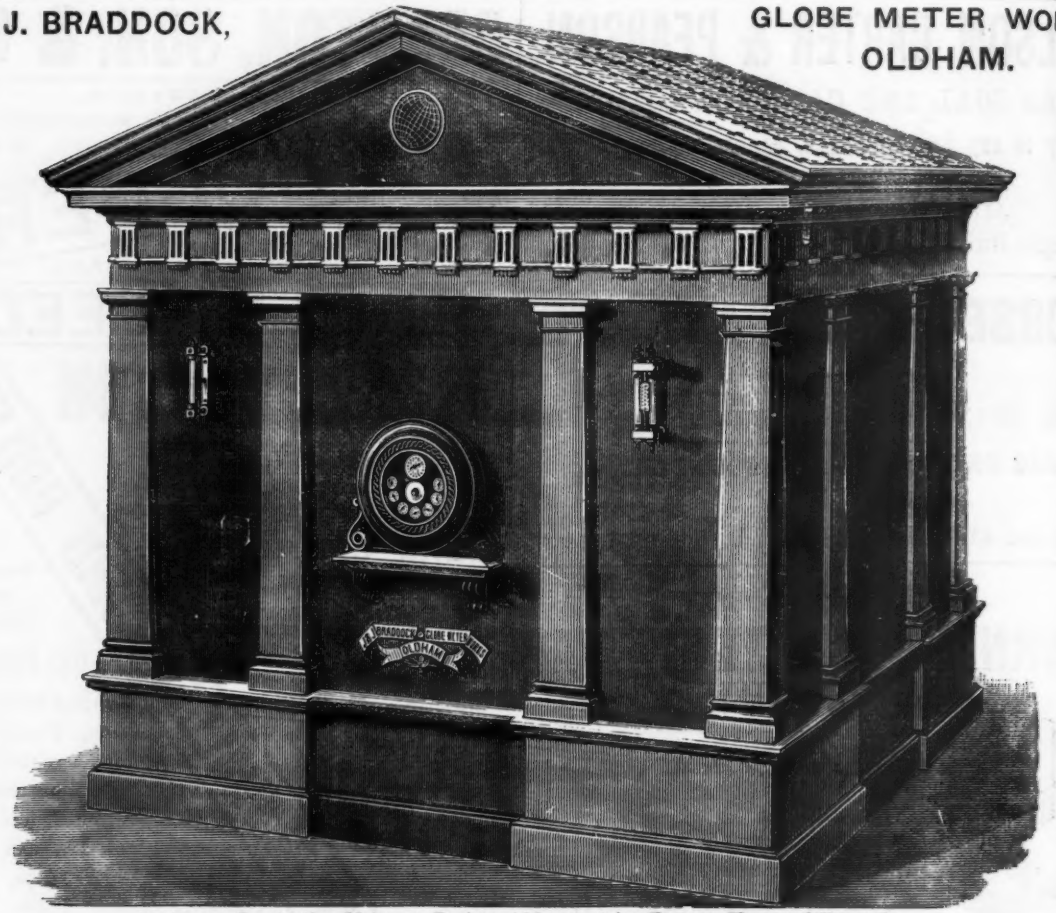

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FOR THE CURE OF STOPPED ASCENSION-PIPES,

A couple of charges of which will clear a stopped pipe, and an occasional charge keeps them clean, and also increases the make per ton and the illuminating power.

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This Lid and Fastener is specially designed for taking up the wear and tear caused by refacing the Mouthpiece and Lid, hitherto in a large measure overlooked; and, in addition, from the special way in which the Lid is attached to the Cross-bar, the Lid has free action, and thus secures a more uniform scrape over the whole surface when being forced home by the Screw, the closing pressure being much more equally distributed than in any other form of fastening. The Lid itself is well ribbed, internally and externally; thus securing the Tightest, Strongest, and Simplest Lid in the Market, and the most easily adapted to existing Mouthpieces. The Cross-bar being of steel, it is not liable to be strained, and there is no Eccentric to wear and become inoperative.

"In answer to your inquiry as to Ruscoe's Patent Retort-Lids, we beg to say that we have used them in several works, and are thoroughly satisfied with their action. We consider they are the best in the market.—G. W. STEVENSON & SON."

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